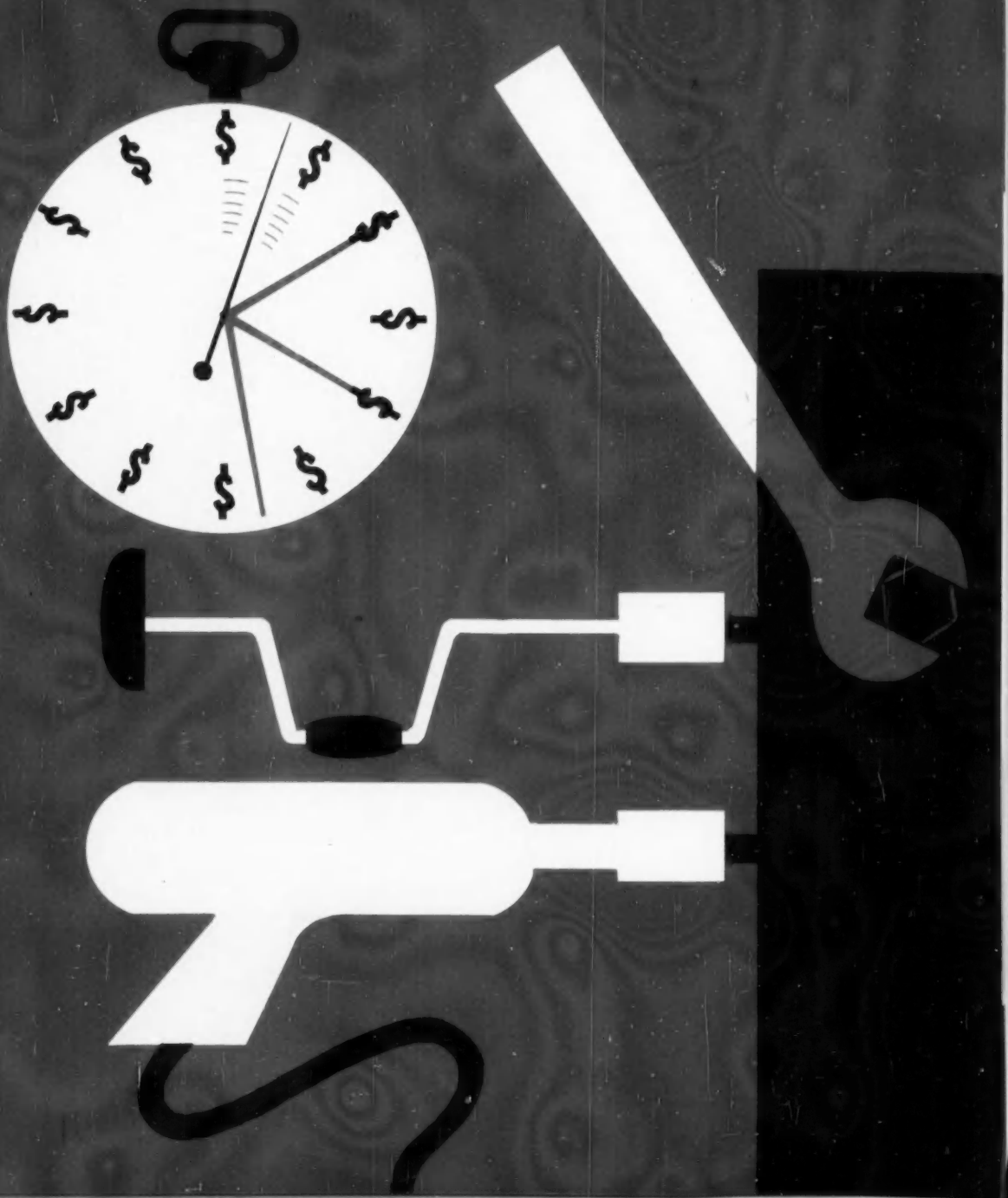
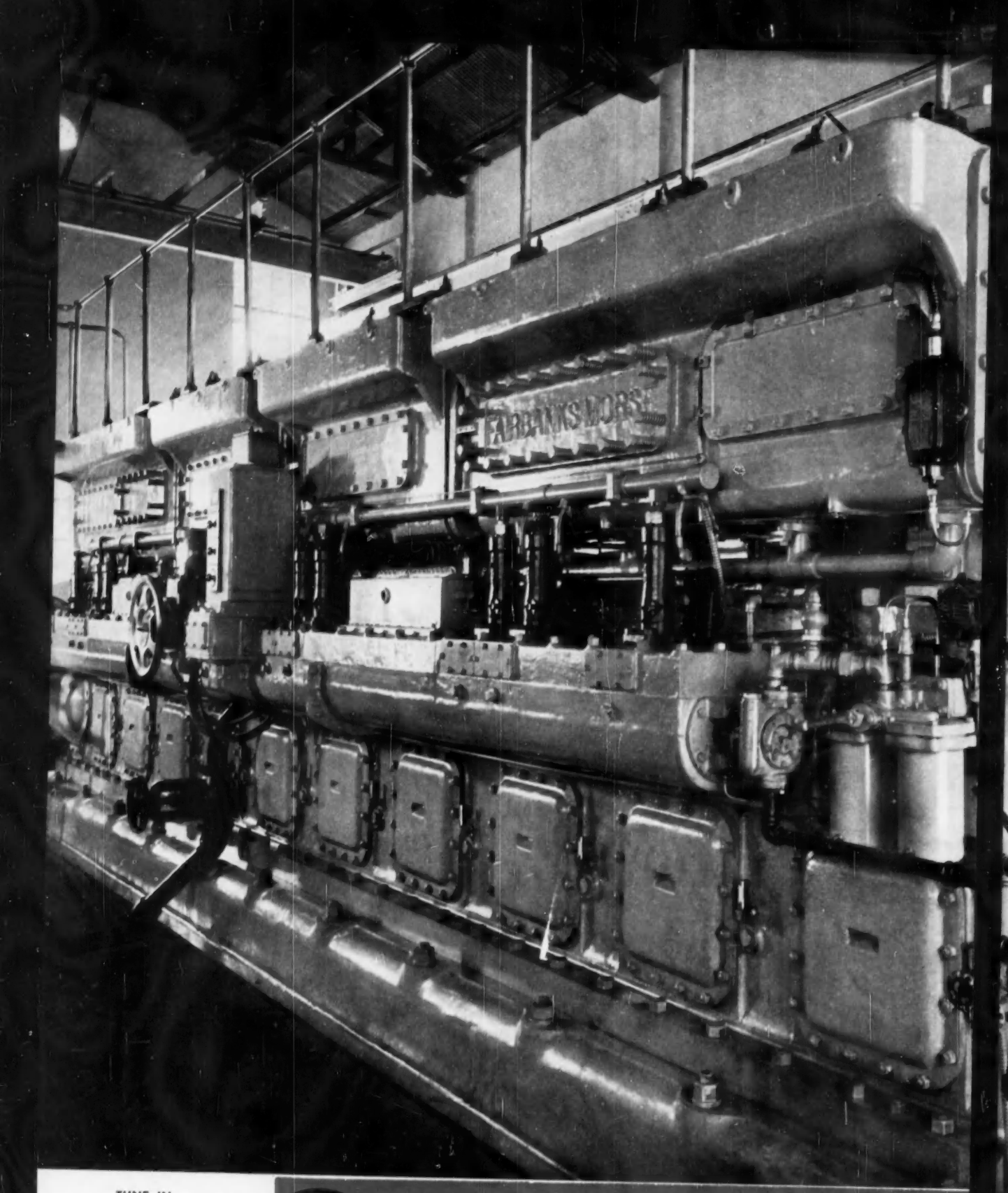
diesel power

February 1956





TUNE IN:
TEXACO STAR THEATER
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JIMMY DURANTE
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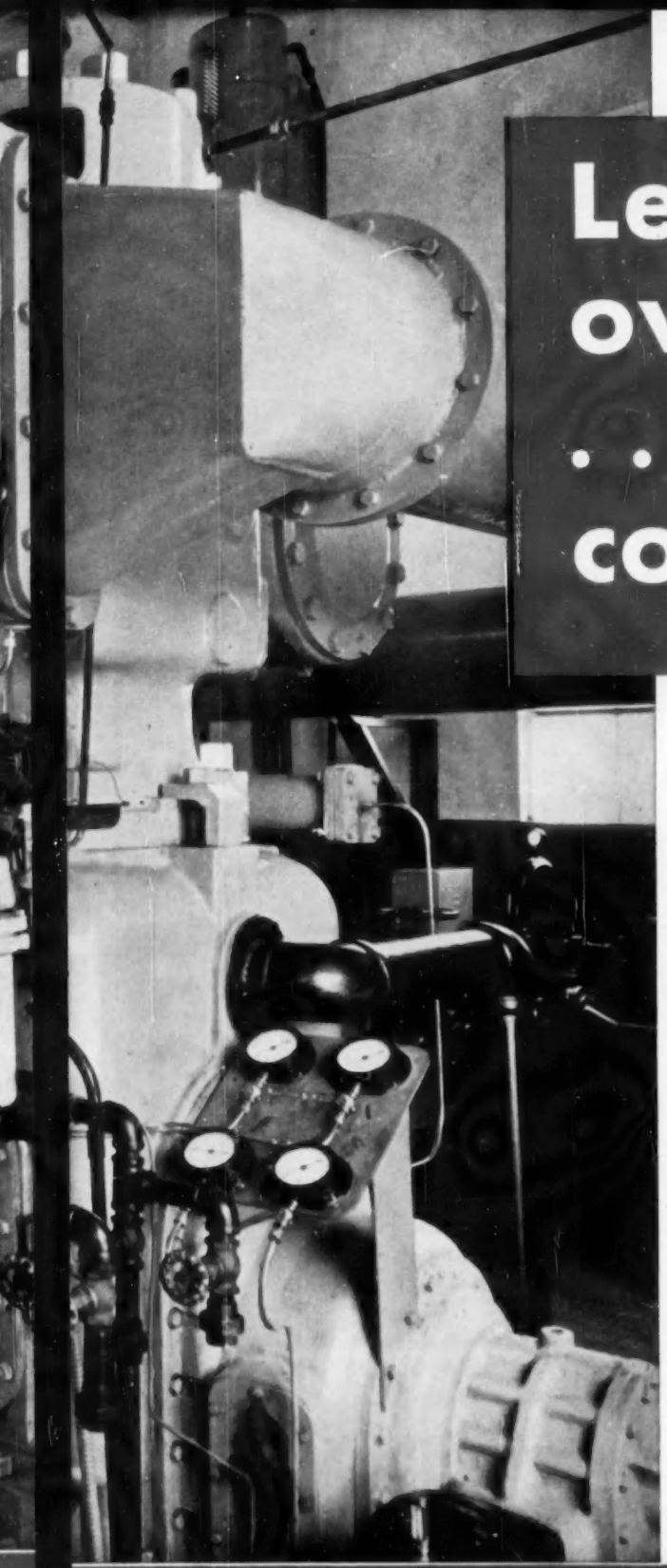

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Operators everywhere have discovered that lubrication with one of the famous *Texaco Ursa Oils* brings these benefits: (1) full power performance, (2) reduced fuel consumption, and (3) longer periods between overhauls.

There is a complete line of *Texaco Ursa Oils*. Whether your engines are diesel, gas or dual-fuel, you can count on the benefits listed above by letting a Texaco Lubrication Engineer help you select the proper one for your particular engines and operating conditions.

Proof of Texaco superiority in this field is evidenced by the fact that—

For over 20 years, more stationary diesel h.p. in the U. S. has been lubricated with Texaco than with any other brand.

To help you improve operating efficiency and reduce maintenance costs, call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

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HERE'S THE ROLL CALL OF DIESEL LEADERS WHO SPECIFY FRAM AS STANDARD EQUIPMENT

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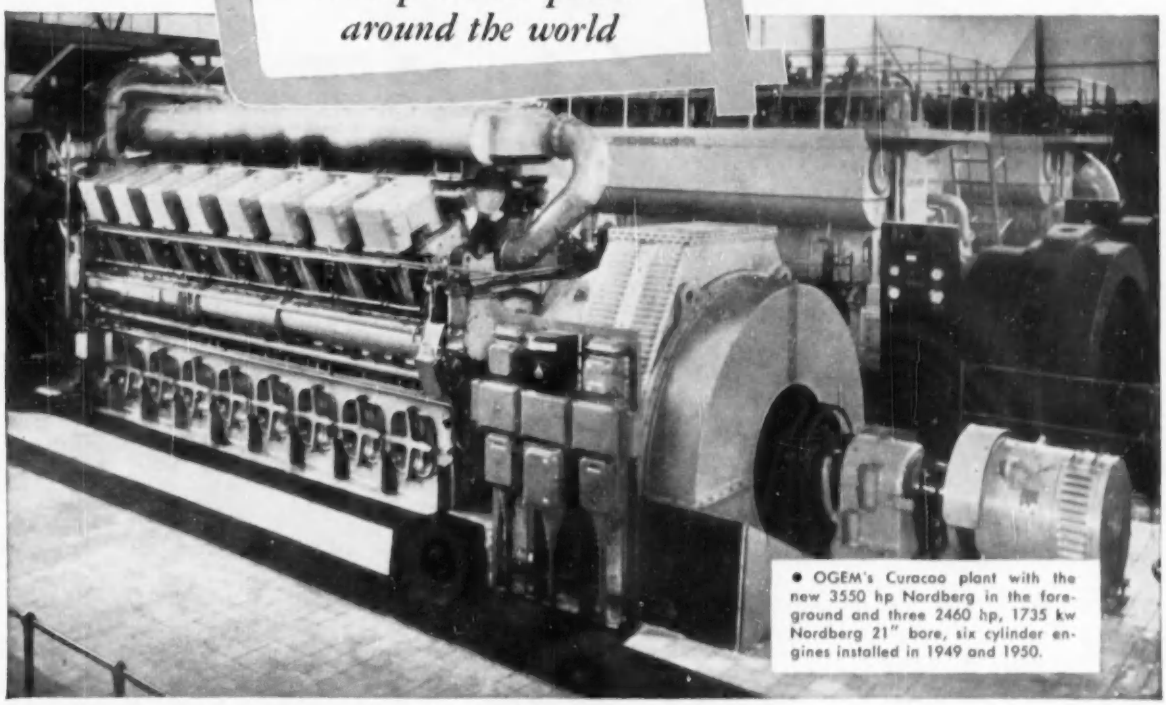
Manufacturers and engineers who design and build diesel engines prefer FRAM. They know FRAM protection means longer life . . . less wear . . . fewer repairs. To get the most from your diesel, always use the filter manufacturers prefer—get FRAM!

FRAM CORPORATION, Providence 16, R.I. Fram Canada Ltd., Stratford, Ont.

. . . dependable power around the world



• OGEM's Curacao plant with the new 3550 hp Nordberg in the foreground and three 2460 hp, 1735 kw Nordberg 21" bore, six cylinder engines installed in 1949 and 1950.

Netherlands West Indies Utility installs its 10th NORDBERG DIESEL

Here's evidence again of the reliability of Nordberg Diesels as N. V. Overzeese Gas En Electricitiet Mattschappij of Curacao, Netherlands West Indies places their *tenth* Nordberg engine in operation . . . a 16 cylinder V-Type *Supairthermal*® Diesel engine rated 3550 hp, 2500 kw at 500 rpm.

Installed at Curacao, the new engine gives this plant a total of 10,930 Nordberg horsepower. Four Nordberg *Supairthermal* engines are also providing 5640 hp at this progressive utility company's Aruba Island plant, and two 2670 hp V-type engines were recently placed in service at the Paramaribo station. *A total of 21,910 Nordberg horsepower!*

When additional power was needed, users like N. V. Overzeese Gas En Electricitiet Mattschappij, *naturally chose Nordberg again.* They have had proof of Nordberg's reliability and low operating and maintenance cost. *It's what they expect of Nordberg Engines!*

Next time you have a power problem, consult Nordberg. Write for further information, outlining your power requirements.

NORDBERG MFG. CO., Milwaukee, Wisconsin

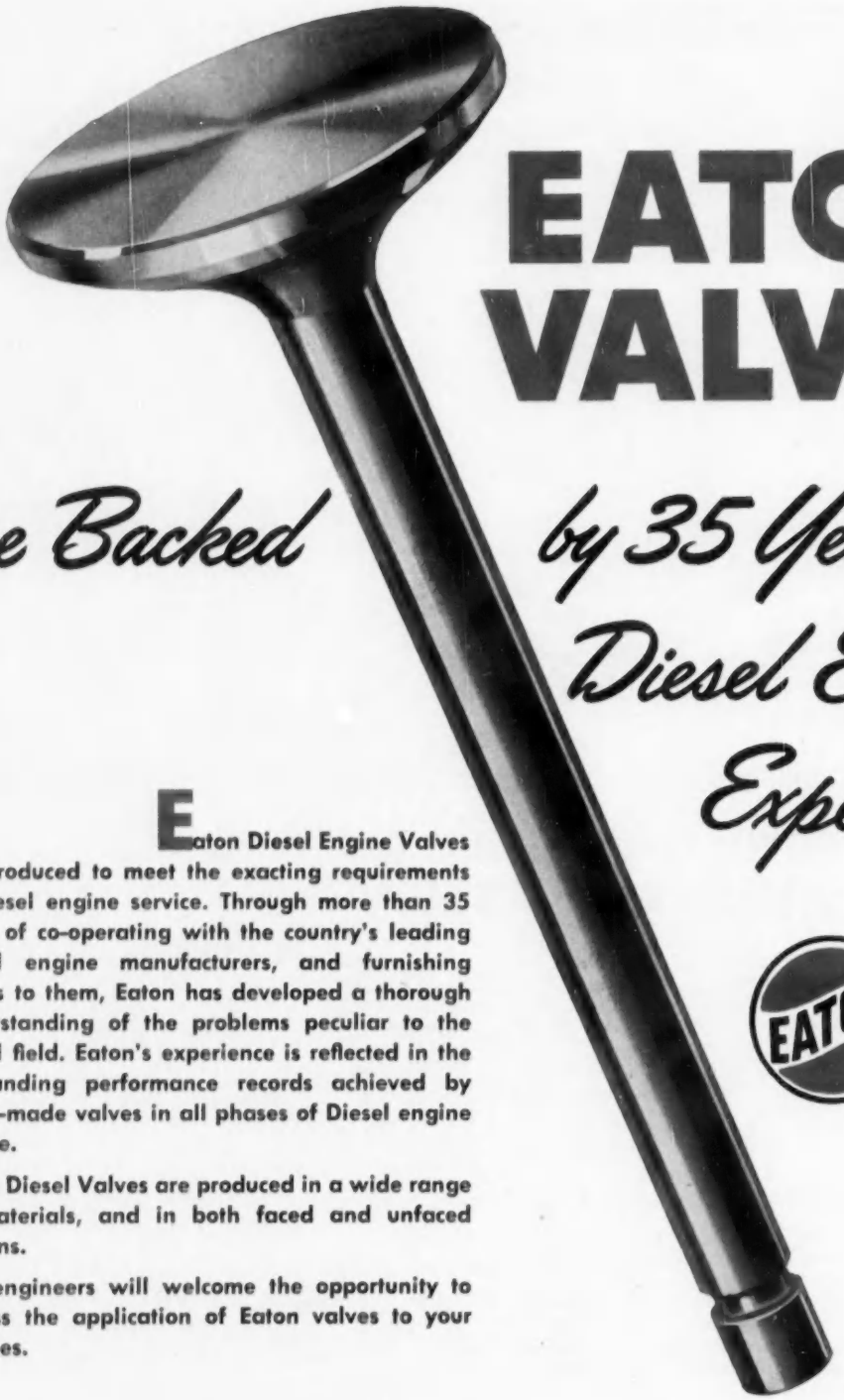
NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

BUILDERS OF AMERICA'S LARGEST HEAVY DUTY ENGINE LINE . . . 10 to over 12,000 HORSEPOWER

P955

© 1955, Nordberg Mfg. Co.



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are Backed by 35 Years of Diesel Engine Experience

Eaton Diesel Engine Valves are produced to meet the exacting requirements of Diesel engine service. Through more than 35 years of co-operating with the country's leading Diesel engine manufacturers, and furnishing valves to them, Eaton has developed a thorough understanding of the problems peculiar to the Diesel field. Eaton's experience is reflected in the outstanding performance records achieved by Eaton-made valves in all phases of Diesel engine service.

Eaton Diesel Valves are produced in a wide range of materials, and in both faced and unfaced designs.

Our engineers will welcome the opportunity to discuss the application of Eaton valves to your engines.

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VALVE DIVISION

MANUFACTURING COMPANY

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diesel power

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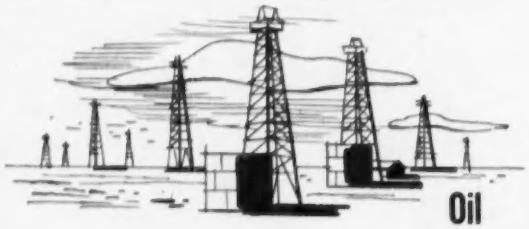
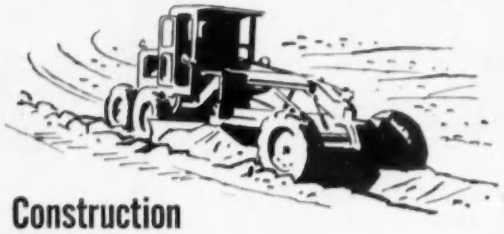
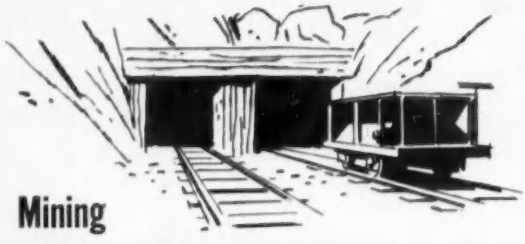

Oil


Construction

Agriculture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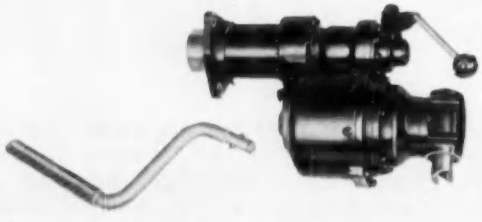
This new hand-cranked inertia starter . . . available in four different models . . . is especially suited for use in remote areas and under difficult operating and climatic conditions.

Use the Bendix AE Inertia Starter where shock conditions can damage storage batteries or disrupt voltage regulation. Use it where battery maintenance is a problem or where there is a fire hazard. Mounts in same place as conventional starter on standard S.A.E. 3-bolt flange.

The Bendix AE Inertia Starter is simplicity itself to install. Requires No Cables—No Pumps—No Plumbing. Get full particulars today. BENDIX INTERNATIONAL DIVISION, BENDIX AVIATION CORPORATION, 205 E. 42nd St., New York 17, N. Y., Cable: "Bendixint", N. Y.



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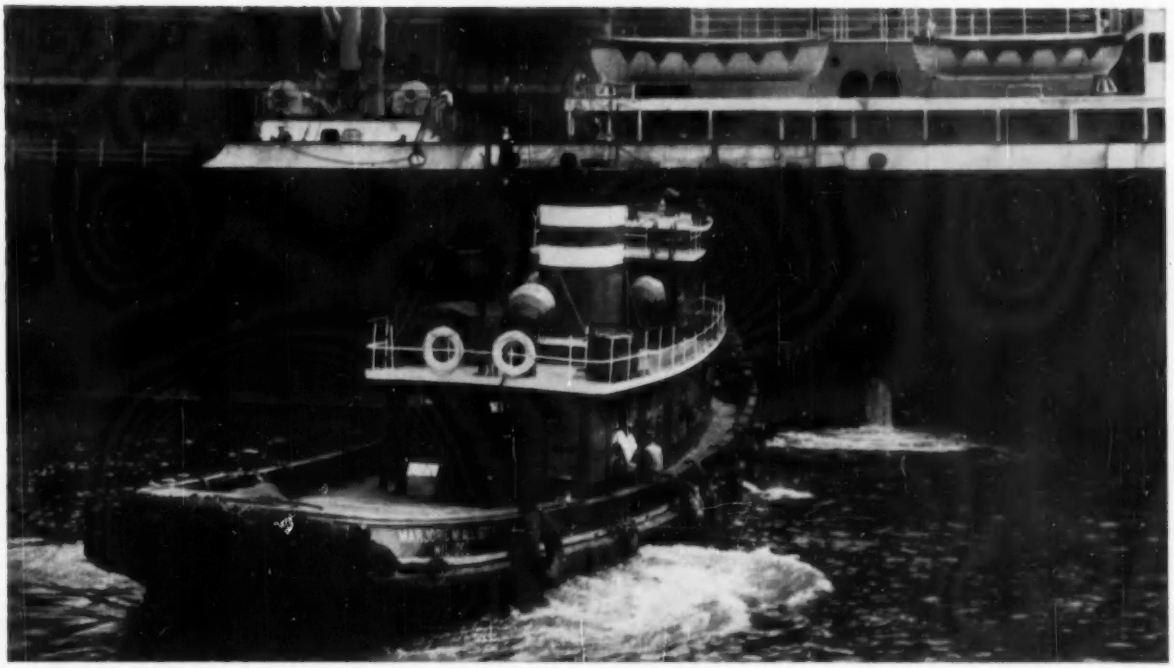


GULF DIESELMOTIVE OIL begins the second decade of dependable service in the P. F. Martin fleet

(McAllister Brothers' Philadelphia Affiliate)

The oil that lubricates the powerful engines of these hard working tugs has to insure dependable and economical operation in a daily routine performed during severe weather conditions, heavy traffic, and changing tides.

Gulf Dieselmotive has consistently proven that it has the quality to stand up and provide effective protection in this tough service. It has contributed greatly to the outstanding operating and maintenance records for all P. F. Martin tugs over the past 10 years—and it is ready to start the second decade.

Gulf Dieselmotive Oil ranks very high with marine operators for several reasons:

1. Chosen for their ability to prevent hard carbon deposits in hot spots, the selected base stocks of Dieselmotive Oil also provide an oxidation resistance safety factor.
2. 100% solvent refining of base stocks (which removes undesirable constituents) guarantees greater stability and more effective bearing protection.
3. Superior additive response is obtained by carefully matching the additives to the base stocks. This insures clean rings, grooves, oil cooling passages, and a minimum of piston crown deposits.

This combination of Dieselmotive qualities makes possible more hours of operation between ring jobs, and lower maintenance costs. Ask a Gulf Sales Engineer—experienced in Diesel engine operation—to recommend the proper grade of this outstanding lubricating oil for your Diesels. Consult the telephone directory for the number of your nearest Gulf office.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

GULF

HIGH POWER—LOW WEIGHT

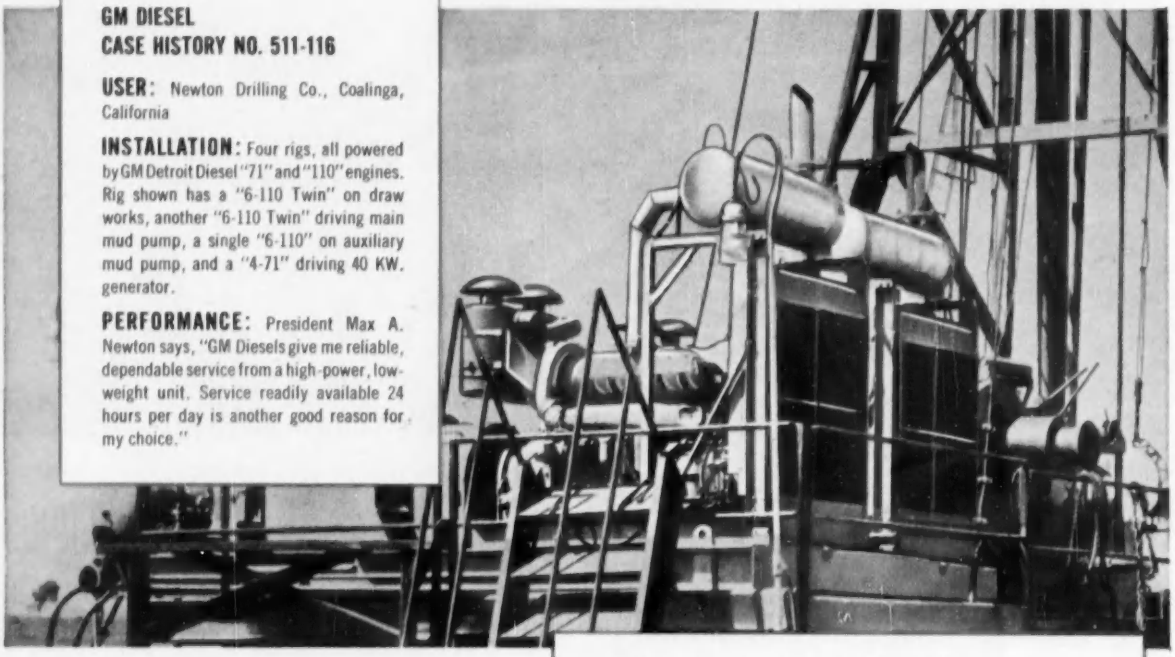
100% Standardized on GM Diesel

GM DIESEL
CASE HISTORY NO. 511-116

USER: Newton Drilling Co., Coalinga, California

INSTALLATION: Four rigs, all powered by GM Detroit Diesel "71" and "110" engines. Rig shown has a "6-110 Twin" on draw works, another "6-110 Twin" driving main mud pump, a single "6-110" on auxiliary mud pump, and a "4-71" driving 40 KW. generator.

PERFORMANCE: President Max A. Newton says, "GM Diesels give me reliable, dependable service from a high-power, low-weight unit. Service readily available 24 hours per day is another good reason for my choice."



WEIGHS less, costs less, makes hole faster.

This is the story behind the success of General Motors Detroit Diesel engines in drilling. These power-packed, 2-cycle work-horse engines have proved themselves on hundreds of drilling rigs by ringing up performance records that are the talk of the industry.

If you're buying a new rig—or repowering your present one—it will pay you to specify GM Diesel. Both Series 71 and 110 units, available with integral GM torque convertors, weigh far less than other Diesels of equal horsepower.

Your GM Diesel Distributor can give you full details on these dependable, moneysaving engines. Call him today or write direct.

Single Engines . . . 80 to 300 H.P. *Multiple Units . . . Up to 895 H.P.*

America's Largest Builder of Diesel Engines

JIMMY DIESEL'S MAINTENANCE TIPS

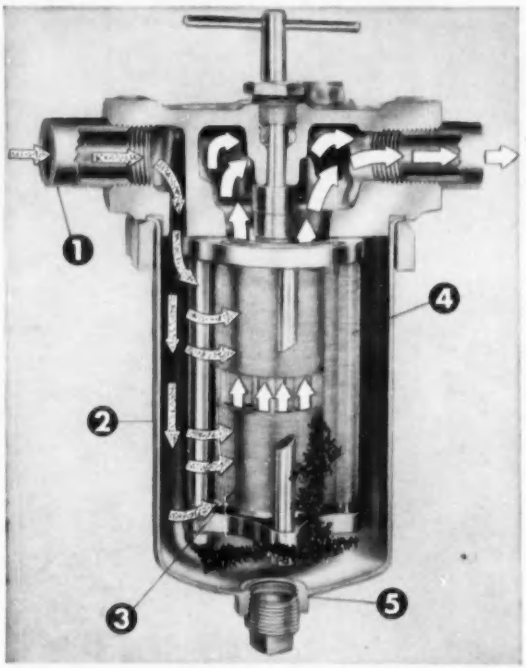
Preventive maintenance helps you avoid costly breakdowns by spotting small troubles before they get to be big ones. Your GM Detroit Diesel Distributor has this Log Book available. He will help you set up a preventive maintenance program and supply you with factory-engineered parts installed by factory-trained servicemen. Call him today —and remember, Preventive Maintenance Doesn't Cost—It Pays.

DETROIT DIESEL

Engine Division
of General Motors
Detroit 28, Michigan

See Your Local GM Detroit Diesel Distributor or Dealer

New CUNO SUPER Auto-Klean Filter can boost engine life up to 50%



HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter. (3) Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Here's what the U.S. Army has done to test Cuno's new 40-micron SUPER Auto-Klean filter for their engines:

They ran destruction tests on several identical engines equipped with different brands of filters. As they ran, dust was introduced into the air intakes. When compression fell to half its initial value, the test was stopped. Best life for engines equipped with cartridge-type filters was 60 hours.

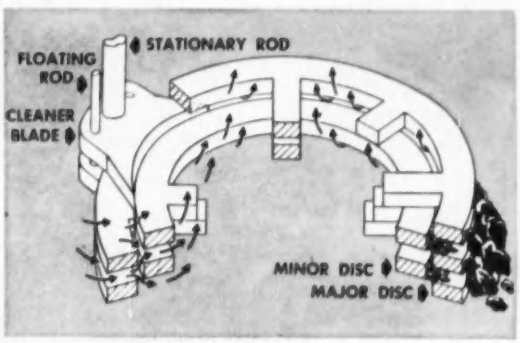
The engine with SUPER Auto-Klean ran 90 hours—50% longer—and *compression was still above half its initial value!*

You can get SUPER Auto-Klean now!

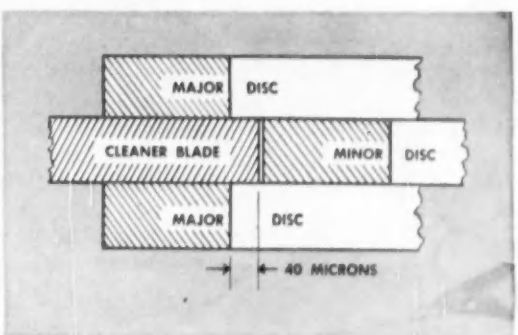
Just specify that the manufacturer equip your new diesel with this latest and best in filtration—both for fuel and full-flow lube. You'll get longer engine life and . . .

1. **Full-Flow** 40-micron filtration with a self-cleaning filter. No cartridge changes; filter can't rupture or channel.
2. **Low pressure drop.** An 8- by 2¾-inch filter element handles 30 gpm of 200 SSU lube oil with only 3 psi pressure drop. You get high capacity in a small package.
3. **All metal.** Can't absorb or adsorb additives from oil.
4. **No interruptions for cleaning.** Handles full flow all the time.
5. **Standard Auto-Klean housing.** On existing engines you can easily replace most 2¾ in. diameter cartridges with SUPER Auto-Klean or simply install SUPER Auto-Klean in the full-flow lube line following the discharge of the engine pump.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing diesel. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 9-2 South Vine Street, Meriden, Connecticut. 5.5



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against precision ground minor disc. Oil flow is shown by arrows.



LARGE PARTICLES (over 0.012 in.) are stopped at space between major discs. Short 40-micron restriction stops 40-micron particles, but allows high flow rate.

CUNO

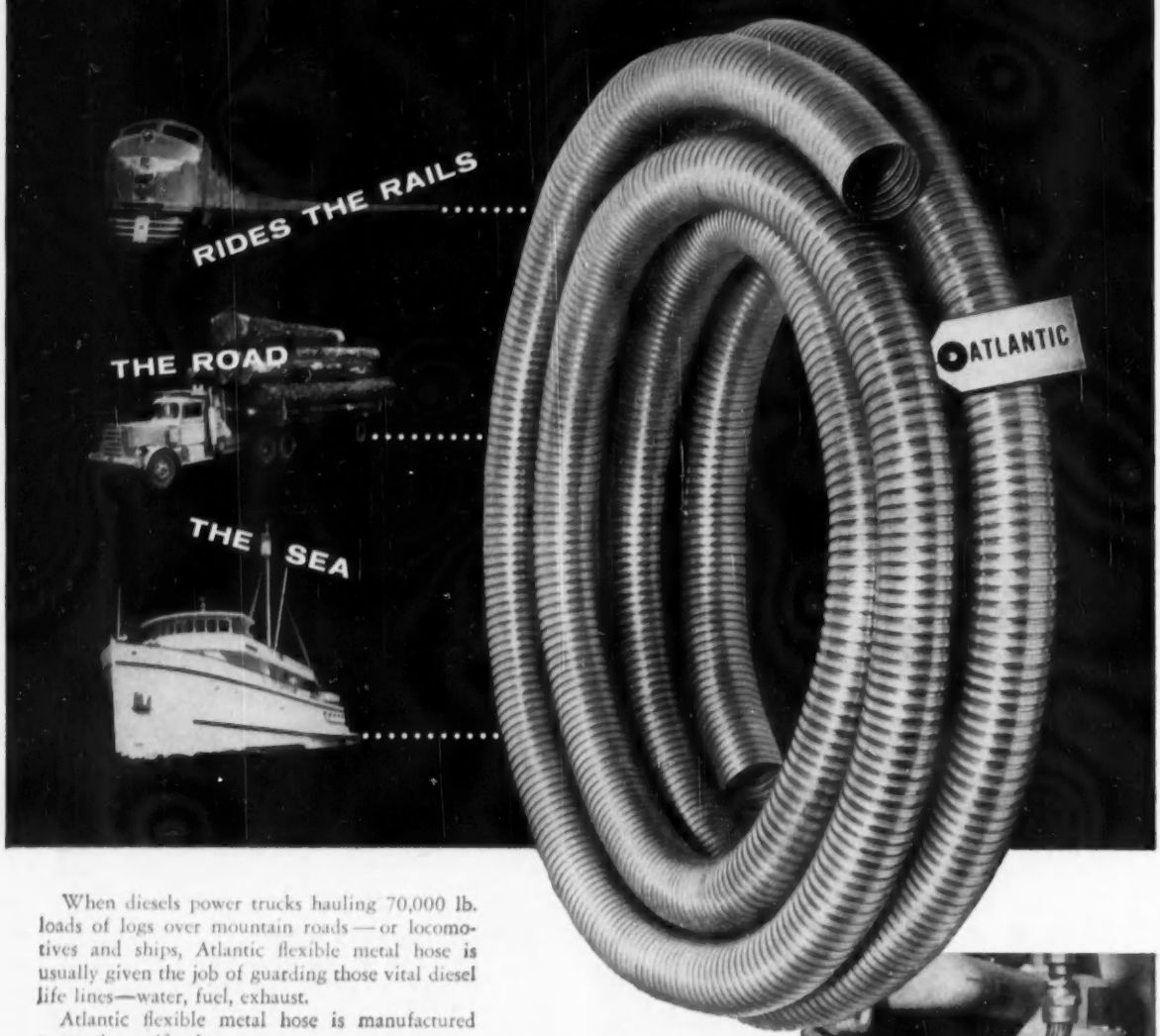
ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

atlantic

FLEXIBLE METAL HOSE

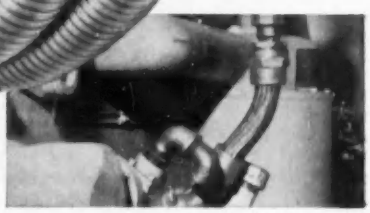


When diesels power trucks hauling 70,000 lb. loads of logs over mountain roads—or locomotives and ships, Atlantic flexible metal hose is usually given the job of guarding those vital diesel life lines—water, fuel, exhaust.

Atlantic flexible metal hose is manufactured to tough specifications.

Wall thickness is absolutely uniform. Tight against water, oil, steam, gas and air. Requires no maintenance. Atlantic flexible metal hose dampens vibration, remains flexible at higher temperatures.

There is an Atlantic flexible metal hose for each of these applications. Made in bronze, steel, stainless and monel—⅛"-36" I.D. with required fittings.



For misalignment and vibration

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Write for Diesel Bulletins 1020 & 50A. See our Catalog in Sweet's Product Design File.

ATLANTIC METAL HOSE CO., INC.

309 DYCKMAN ST., NEW YORK 34, N. Y.

County Courthouse, Newkirk, Oklahoma

Where does the Court get its power?

For seven years in Newkirk, Oklahoma, one powerful machine controlled the power of the court...a Fulton 800 H.P. dual-fuel generating unit, lubricated by Cities Service Pacemaker #5 Oil.

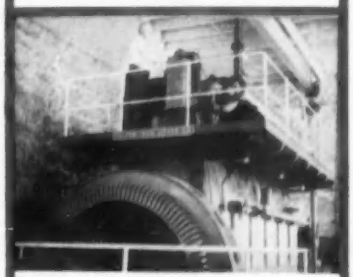
But it wasn't only the court that depended upon this one machine . . . the entire town relied upon it. If the machine failed, so might the annual grain harvest, for Newkirk's grain elevators require great quantities of power.

BUT THE FULTON GENERATING UNIT AND CITIES SERVICE LUBRICATION PROVIDED FAULTLESS SERVICE. There was never a breakdown.

Newkirk's power boss, Superintendent of Utilities Ralph E. Cottrell, sums it up this way: "Using Pacemaker #5 in the engine's crankcase and cylinder lubricators, we not only enjoyed trouble-free operation during those seven years, but also surprisingly little wear and oil consumption. Rings, bearings and liners remained in top notch condition and the engine piled up well in excess of 6000 horsepower hours per gallon of oil."

This is but one more powerful story of Cities Service Lubrication . . . a graphic illustration of the kind of results you can expect from these highest quality lubricants. Why not get the whole story from a Cities Service Lubrication Engineer? Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

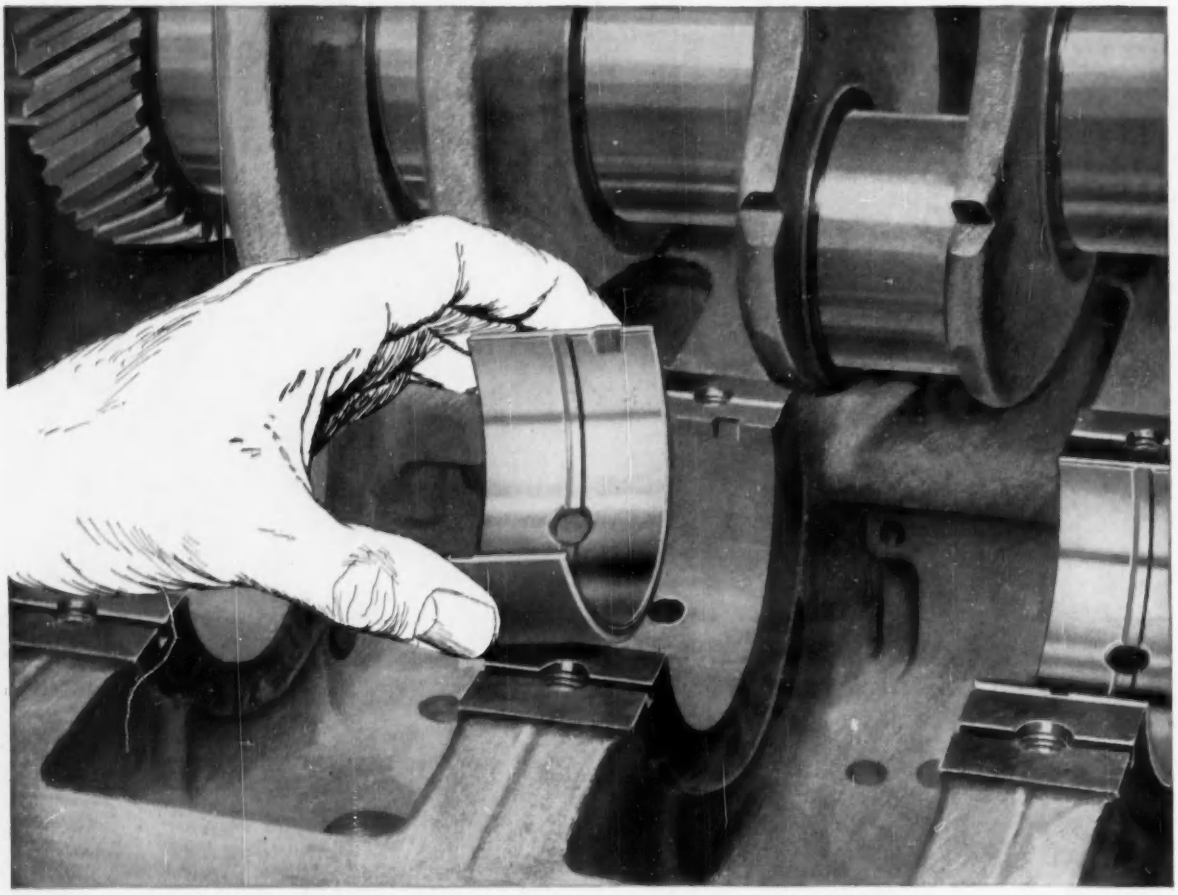
Ralph E. Cottrell, Power Boss of Newkirk, Oklahoma. All of Newkirk depends on him as Supt. of Utilities. He depends on Cities Service Lubricants for town's power generators.



Powerful Machine Behind The Court is this Fulton 800 H.P. dual-fuel generating unit. For seven years Newkirk's only major power source, it gave "faultless performance" using Cities Service Lubricants.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Why these bearings mean longer diesel life

● Clevite* 77 bearings are standard factory equipment in most heavy-duty diesel engines for all applications from stationary power to earth-moving and highway transport.

These bearings were designed to provide the higher fatigue strength and greater ability to dissipate heat which are essential in this service. They were designed, too, to provide a bearing surface that would not damage the costly shafts in these engines.

When your diesel engines need overhaul, be sure to replace bearings with Monmouth's* identical replacements... Clevite 77... available nationwide through N. A. P. A. jobbers. You'll get the same long life and dependable performance you had with the original.

*The words Monmouth, Clevite and Micro are registered trade marks of Clevite Corporation.

Monmouth

TRADE MARK

ENGINE BEARINGS

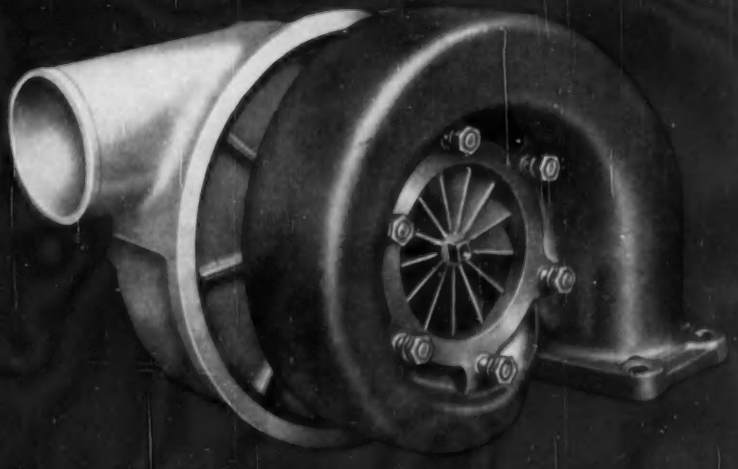
Clevite Service
The Cleveland Graphite Bronze Co.
Division of Clevite Corporation, Cleveland, Ohio, U. S. A.

NAPA Assurance of Quality

Your NAPA Jobber is a Good Man to Know!

SCHWITZER

TURBOCHARGERS



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With 30 Years of Extensive Research and Production Experience in the Supercharging Field, Schwitzer Now Offers a Complete Line of 4 Sizes of Turbochargers For 50 to 1200 HP Installations. Now in Production in All Heavy Duty Fields—Truck-Tractor-Stationary-Marine.

SCHWITZER CORPORATION

INDIANAPOLIS, INDIANA

the design that gives you

. . . more power . . . with less fuel . . . over longer periods between overhauls

Powerful, efficient performance . . . reduced fuel costs . . . minimum down-time. That's what you can expect from your diesel or gas engines with Pedrick *conformable* oil rings.

The Pedrick DO8 design makes this possible: two separate cast-iron pieces, thin and flexible, provide independent cylinder contacting surfaces. These are kept under absolutely uniform tension by the exclusive Pedrick "Equalizer". This feature provides a soft but positive and uniform pressure *all around the cylinder wall*, with both radial and axial conformability. With the DO8 you get the effect of *two* very conformable oil rings in one groove.

The result is more effective oil control with less unit pressure and ring friction. Wear is reduced. Overhaul periods are extended. Oil control stays constant for tens of thousands of hours. Carbon pollution is all but eliminated.

Whether your requirements are single rings or engineered sets, it will pay you to insist on Pedrick. Engineering service is available to help you with special problems.

Write, phone or wire: WILKENING MANUFACTURING CO., Philadelphia 42, Pa. SAratoga 9-3770. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

PEDRICK PIONEERED CONFORMABLE OIL RINGS

Pedrick PISTON RINGS

The Engineer's Field Report

CASE HISTORY
LUBRICANT RPM Delo Oil RR Special
FIRM Northern Pacific Railway, Missoula, Montana

Diesel still using original rings, bearings after 140,000 miles on mountain freight run

FOUR PERCENT GRADES and 16-degree curves make Northern Pacific's run through Lookout Pass a severe test for diesels. Locomotives haul ore and heavy equipment between Wallace, Idaho, and St. Regis, Montana, on a daily round-trip schedule of 114 miles. Using RPM DELO Oil RR Special, a GP-7 on this run has gone 140,000 miles with original rings and bearings—and is still in service. Northern Pacific says, "We have never had any trouble with this locomotive. It is still very clean, still performing well." Three other GL-7's and a GP-9 (above) have been used on the run during a 2½-year period. Northern Pacific Railway uses RPM DELO Oil RR Special in all road diesels on this run.

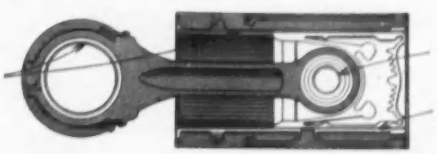
FOR MORE INFORMATION about petroleum products of any kind or the name of your distributor, write or call any of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U. S. PAT. OFF.

Why RPM DELO Oil RR Special prevents wear, corrosion, oxidation

Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.



Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean... helps prevent scuffing of cylinder walls. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

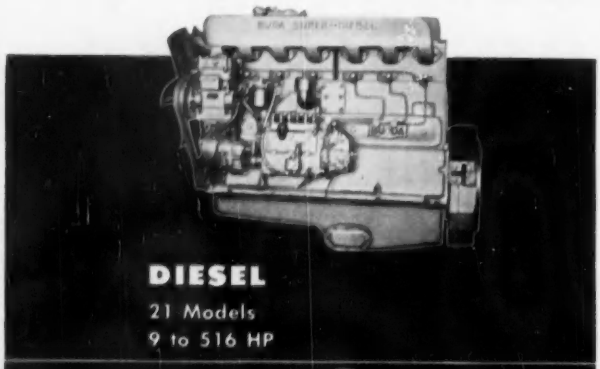
STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

ALLIS-CHALMERS

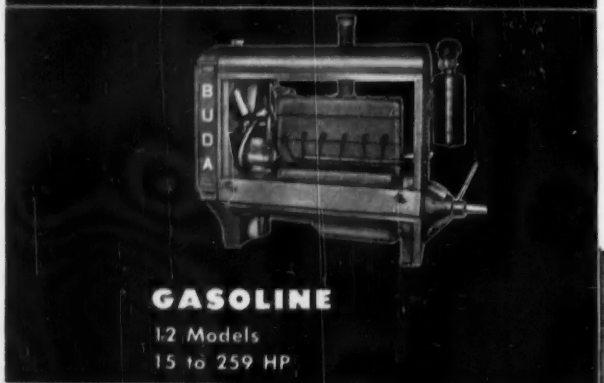
in increased

Specify or Install A-C

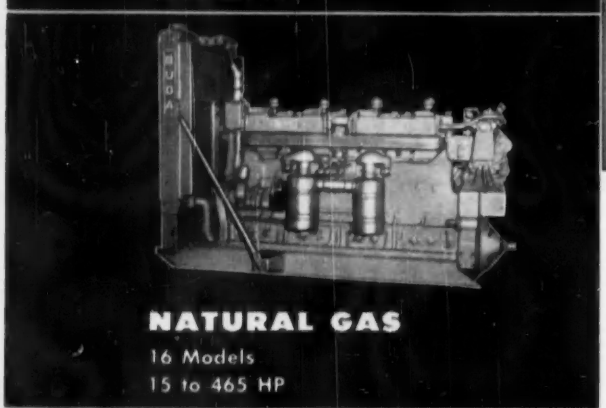
There are no "compromise" engines in the ALLIS-CHALMERS line. You can specify or install the *exact* type, size and fuel engine to fit any piece of construction equipment from a small pump to a giant dragline — and be sure you're getting the kind of power that pays off in more production and lower cost per horsepower hour of operation.



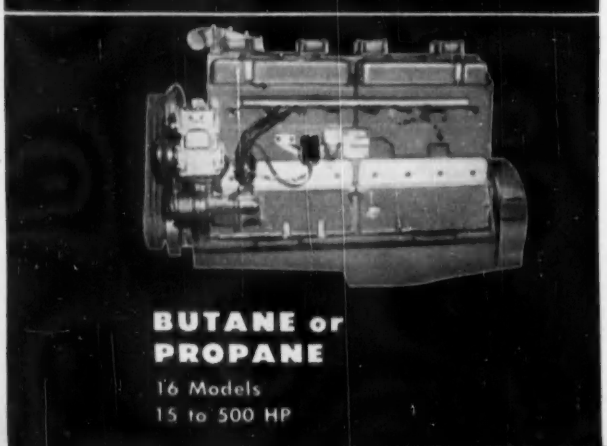
DIESEL
21 Models
9 to 516 HP



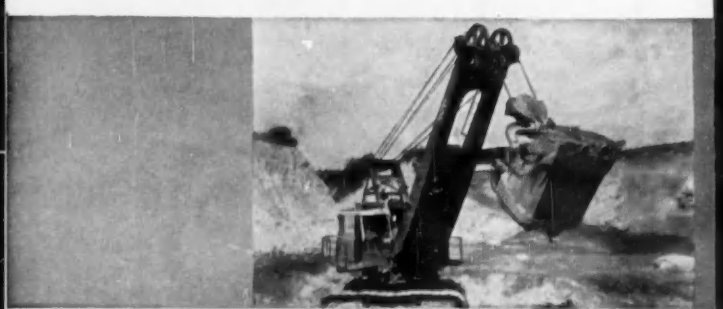
GASOLINE
12 Models
15 to 259 HP



NATURAL GAS
16 Models
15 to 465 HP



BUTANE or PROPANE
16 Models
15 to 500 HP



SHOVELS

Choose any of 65 basic models . . . 9 to 516 horsepower . . . select any type of fuel — Diesel, gasoline, natural gas, butane or propane — and you'll get a ruggedly built, workhorse that will run longer with less downtime and maintenance than any other engine.

ALLIS-CHALMERS power is *the* answer to today's demands for more power for more production, better performance and longer life.

Before you buy or specify any engine . . . GET THE ALLIS-CHALMERS POWER STORY! Your nearby ALLIS-CHALMERS Buda Division Distributor has facts and figures that will interest you. See him soon.

POWER PAYS OFF

production in any equipment

Diesel, Gasoline, Natural Gas, Butane or Propane Engines

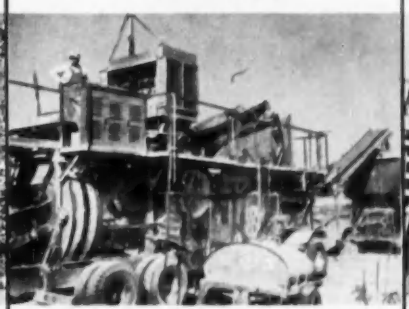
for MORE WORK at LESS COST!

TRACTORS

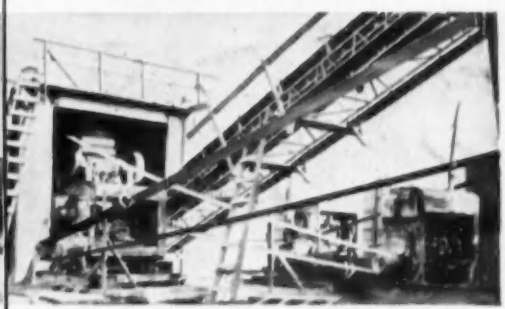
DRAGLINES

MOTOR SCRAPERS

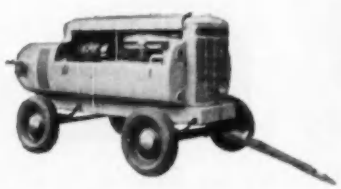
HAULAGE UNITS



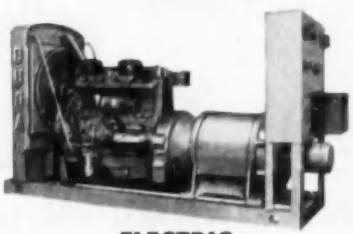
CRUSHERS



QUARRY EQUIPMENT



COMPRESSORS



ELECTRIC GENERATING PLANTS

Write for more information on ALLIS-CHALMERS Power for construction equipment.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

DIESEL ENGINE MANUFACTURERS RECOMMEND.....

SIOUX

VALVE GRINDING MACHINES

When it comes to the big jobs, there's nothing like the SIOUX No. 682 Valve Grinding Machine for ruggedness, speed, precision, and dependability.

The No. 682-L, equipped with lever operated chucks, has capacity with two chucks, for ¼" to 1¼" valve stems, and 6½" valve heads. It takes valves up to 18" long with aligner, no limitation when chuck bushings are used.

A SIOUX No. 682 Valve Grinding Machine is shown grinding valves in head reclamation operations for Diesel locomotives. This picture was taken in the FRISCO Diesel Shop at Springfield, Missouri.

and...

SIOUX

VALVE SEAT GRINDING EQUIPMENT

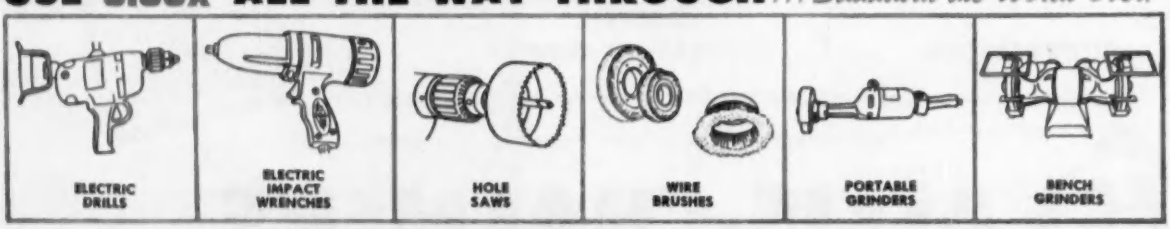
The greatest possible accuracy can be obtained with the SIOUX Dual-Action Valve Seat Grinder and SIOUX Tapered Pilots. SIOUX Tapered Pilots are precision tools and offer the most positive guide known. Dual-action is a controlled fine vibration for grinding and dispersion of the cuttings with the grinding wheel mounted for full contact with the Valve Seat. A perfected system.

Factory approved sets for Allis Chalmers, American Locomotive, Baldwin Locomotive, Case Tractor, Cooper-Bessemer, Ferguson Tractor, General Motors Corp., Hercules Engines, Ingersoll Rand, International Harvester Tractor, International Harvester Truck, John Deere, Massey Harris, Minneapolis-Moline, National Supply, Onan Motors, White Motor Trucks.

LEFT: Heavy Duty Dressing Tool shown with Heavy Duty Driver dressing grinding wheel.

BELOW: Lifting spring is placed on pilot and grinding wheel brought up to speed before grinding.

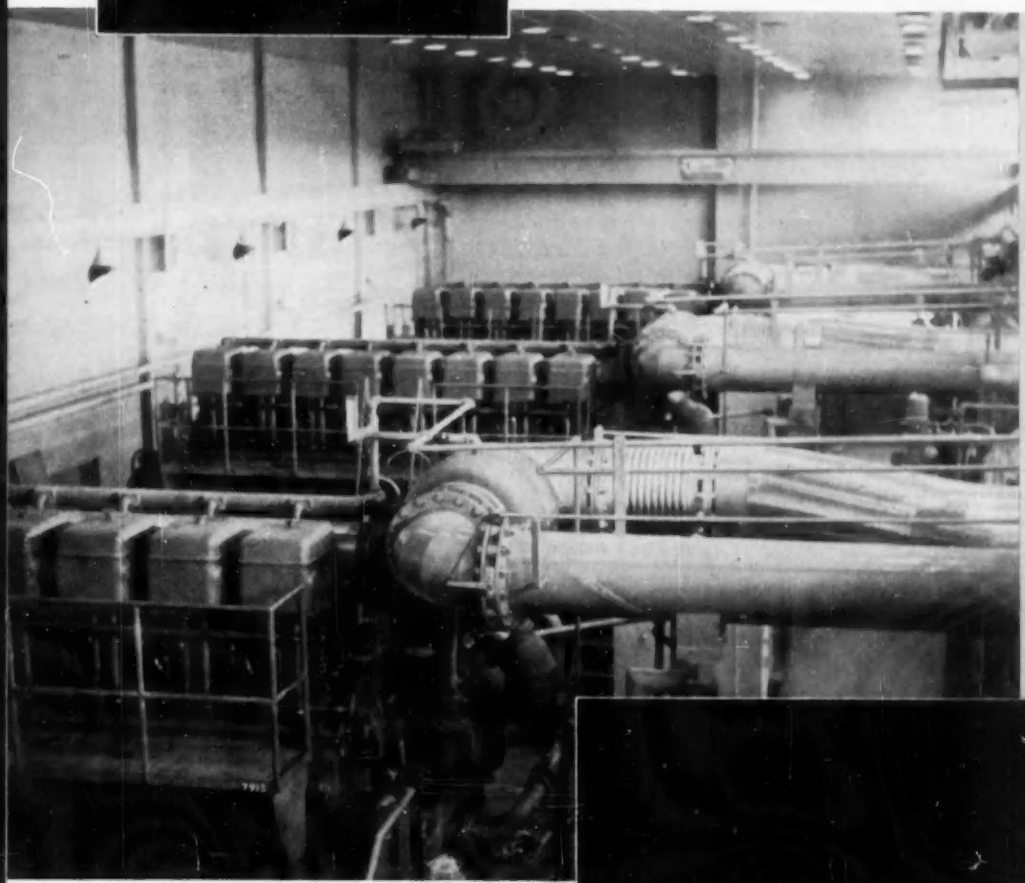
USE SIOUX ALL THE WAY THROUGH ... *Standard the World Over!*



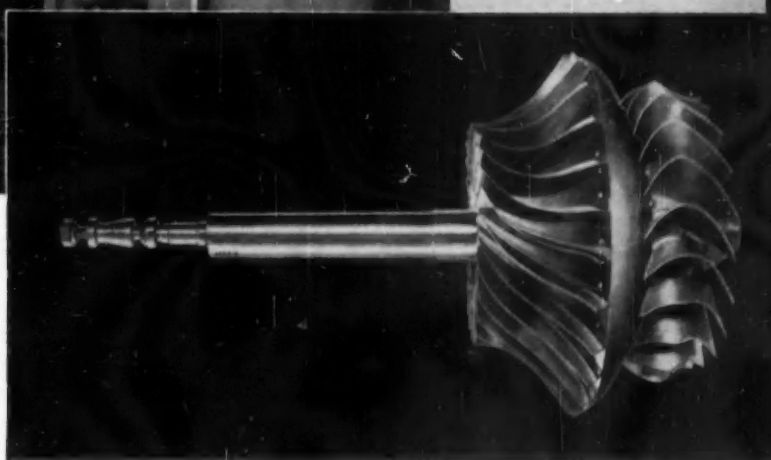
ALBERTSON & COMPANY, INC. SIOUX CITY, IOWA, U.S.A.

DE LAVAL
HIGH PRESSURE TURBOCHARGERS

efficiently serve diesels at Lakehead Pipe Line Company



Exclusive
MONOROTOR
Construction



Located in an outlying district in Northern Minnesota, this oil pumping station of the Lakehead Pipe Line Company must have *dependable, efficient* equipment. That's why Nordberg Diesel engines *with De Laval High Pressure Turbochargers* were chosen for this service.

The De Laval turbochargers efficiently utilize the exhaust gases to supply the high intake air requirements of these 1800 BHP, eight cylinder, four-cycle Supairthermal engines. Shown in the photograph are three units. Six other identical engines operate in pairs in three other stations of this company.

Due to the exclusive Monorotor design, De Laval High Pressure Turbochargers have a pressure ratio up to 3:1, as well as far higher pressure and turbine efficiencies than those found in conventional turbocharger systems. They are self-adjusting to engine loads, can be used with 4- *and* 2-cycle engines.

Write for De Laval Bulletin 8000 giving comprehensive curves and flow range diagrams.

DE LAVAL *Turbochargers*

DE LAVAL STEAM TURBINE COMPANY
890 *Nottingham Way, Trenton 2, New Jersey*

DL 334

ADC* REPORT

LOUISVILLE TRANSIT COMPANY, LOUISVILLE, KENTUCKY

adopts Shell ADC Oilprint Analysis as major oil change yardstick . . .

uses it for faster, surer Preventive Maintenance

LOUISVILLE TRANSIT COMPANY, noted for its preventive maintenance record, has adopted the ADC Oilprint Analysis. Result: reduced PM time and outstanding economy in labor and parts.

The ADC Oilprint Analysis enables fleet operators to test the condition of crankcase oil in the short time allotted for re-fueling and crankcase oil checks . . . a dependable evaluation in *minutes*. It answers the question "When do I change my oil?", thus eliminating the draining of usable oil and the risk of using oils loaded with contaminants.

ADC Oilprint Analysis can take an active part in your PM program. Let us demonstrate how it can effect savings for your engines. *Trademark

SHELL OIL COMPANY

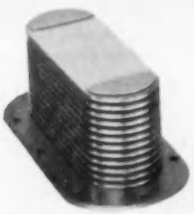
50 WEST 50th STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

SHELL

DIGS COOL!

AND HARRISON HEAT EXCHANGERS DO THE JOB!

Harrison helps move the earth . . . by making heat bite the dust! High-powered shovels—driven by Detroit Diesel 2-cycle engines—turn in dependable, low-cost performance when Harrison's on the job controlling the heat. You'll find Harrison heat control equipment on many of the nation's leading diesels and other power equipment. For manufacturers know they can depend on Harrison—with over 45 years' experience in manufacture, design and engineering research. If you have a cooling problem, look to Harrison for the answer.



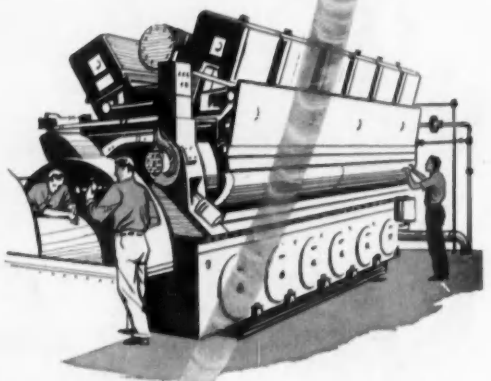
GM

HARRISON

RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

TEMPERATURES MADE TO ORDER

MORE DRIVE for your diesel!



Here is how the application of AiResearch Turbochargers can affect the performance of your mobile or stationary diesel equipment:

✶ Adds more power in relation to size and weight than any other units in this field.

✶ Decreases fuel consumption. Besides decreasing costs, this factor greatly increases the non-refueling range for mobile equipment.

✶ Provides power as needed by responding rapidly to acceleration requirements. This factor greatly decreases smoking.

✶ Maintains sea-level power under all altitude conditions.

✶ Greatly reduces the noise level of your equipment while eliminating power-wasting mufflers.

AiResearch is the largest producer of small turbomachinery in the United States. Twenty-five *million* hours of experience in deriving exceptional power from small units is the background for the development of the AiResearch Turbocharger. This power package was recently applied to Caterpillar diesel machinery with startlingly effective results.

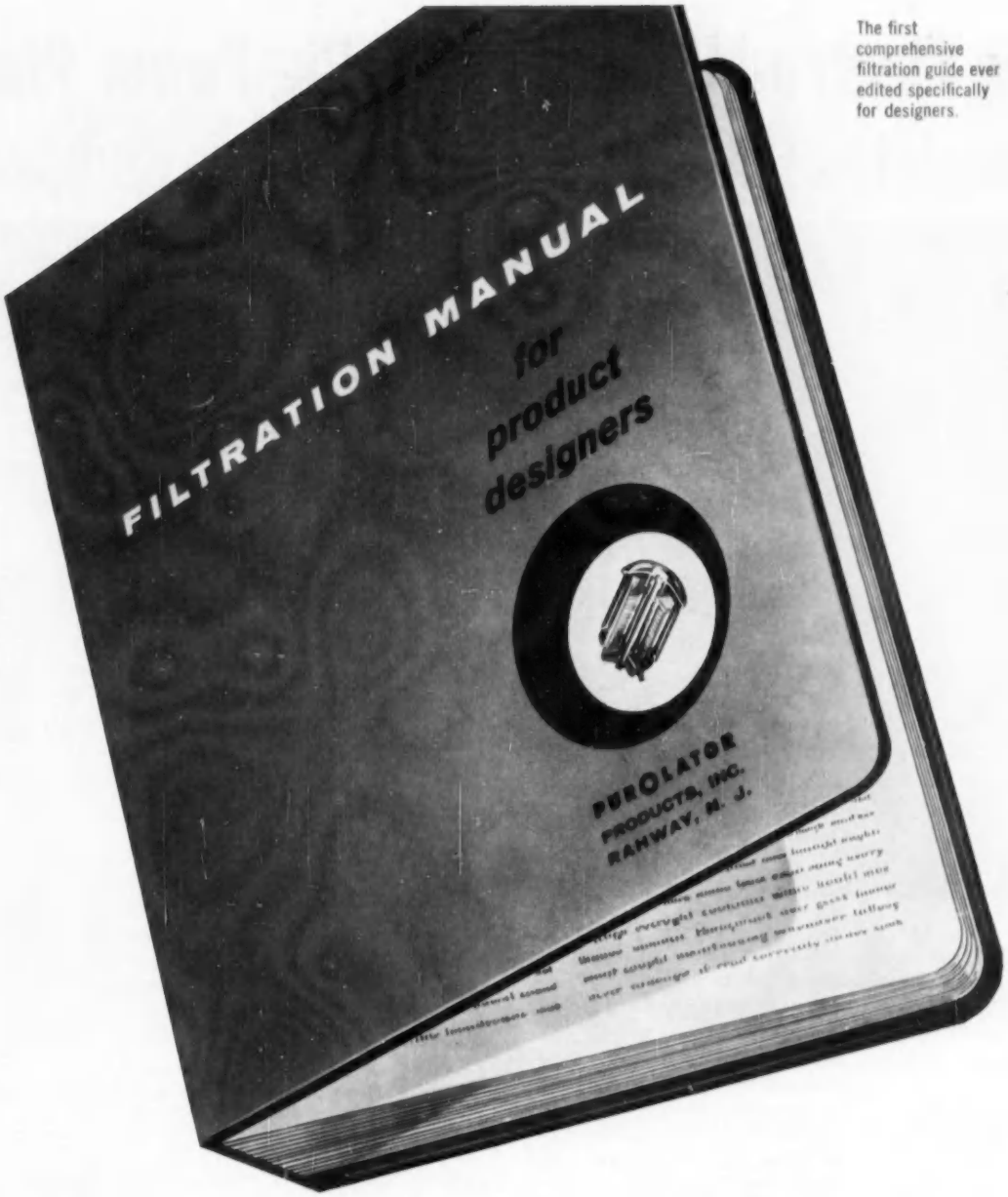
Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY



The first comprehensive filtration guide ever edited specifically for designers.

Where are filters used? Why are filters used? How do filters save money? Now for the first time Purolator's new "Filtration Manual for Designers" has all the answers gathered together in one place.

Some typical section headings

- **space requirements**
- **filter costs**
- **selection of type of element**
- **deciding flow capacity needed**
- **economics of filtration**
- **how Micronic® and metal edge filters are made**

"Filtration Manual for Designers" spells out application considerations in detail including degree of filtration, flow rate, contamination to be removed, viscosity of fluid, plus a complete glossary of terms that apply to filtration. Printing of this manual is limited so please send in coupon for your copy today.

PUROLATOR PRODUCTS, INC.
Dept. DB-211 Rahway, N. J.

Please send my copy of your "Filtration Manual for Designers." I'm enclosing 25¢ for postage and handling.

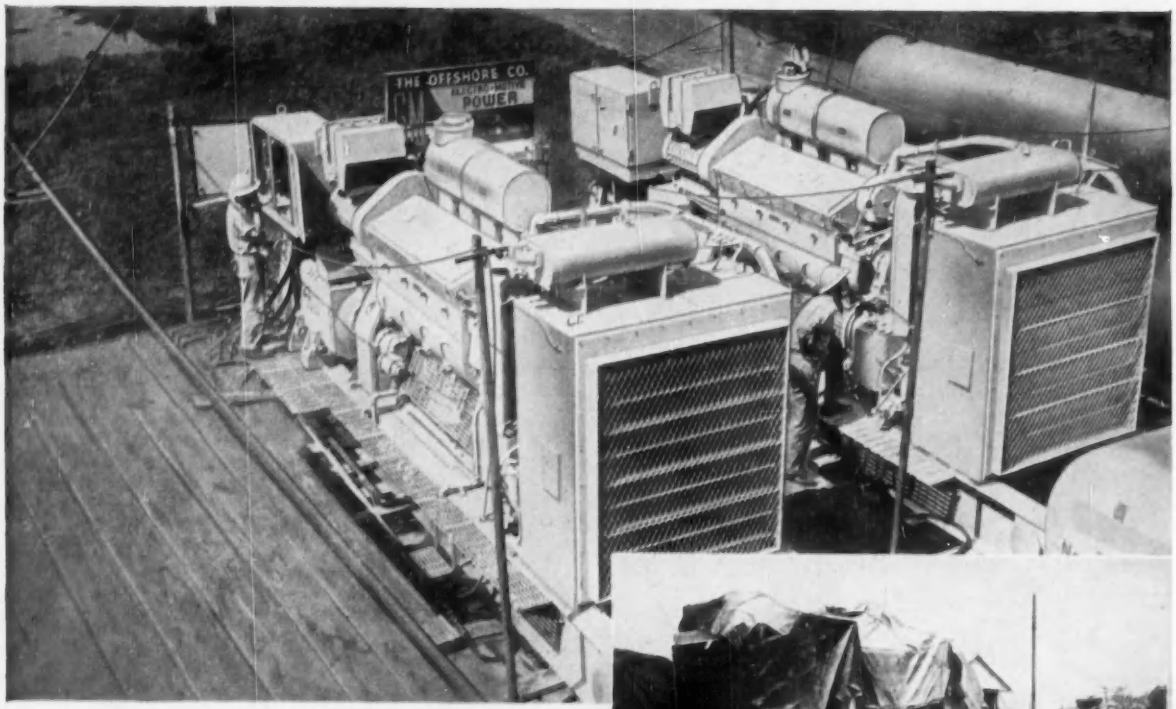
NAME _____

COMPANY _____ POSITION _____

STREET _____

CITY _____ STATE _____

New Electro-Motive Drilling-Rig Power Plant Completes First Hole...for Offshore Company



Maximum portability of Electro-Motive Power Units is shown in this photo of skid-mounted 8-cylinder Diesel engine-generator set being delivered to Offshore Company drilling site near Houma, La.

The first Diesel-Electric drilling-rig power units built by Electro-Motive drilled their first hole to a depth of 12,000 feet for The Offshore Company of Baton Rouge, La. A second hole is now being drilled.

These flexible units offer the petroleum industry an entirely new concept in a Diesel-Electric drilling rig. A compact, lightweight package with all components engineered, built and backed by *one* manufacturer, the Electro-Motive unit features simplified control and rugged dependability at a cost far below that of previously built Diesel-Electric rigs and comparing favorably with Diesel-mechanical rigs.

Basic unit consists of eight-cylinder General Motors 567C two-cycle Diesel engine—developing 875 continuous horsepower—mounted on portable skid with two generators, generator control cabinet and engine cooling apparatus. Direct current electricity from the generators is supplied by cable to the 625-horsepower motors which, singly or in pairs, supply power for the mud pumps, draw works and rotary table.

Unmatched Flexibility

Power transmission cables are quickly and easily connected and disconnected with no bolting or taping required. Thus setup time is reduced to a minimum. Engine-generator units in land operation can be placed anywhere near the drilling site, with no need for heavy foundations or worry about alignment with mud pumps, draw works and rotary table as is required with mechanical rigs. In offshore operations, the advantage is that Electro-Motive power can be put into a minimum of space with important savings in high-cost deck area of barge.

For further information, write or call your nearest Electro-Motive representative.

Electro-Motive Division offices located in New York City, Chicago, Jacksonville, St. Louis, Tulsa and San Francisco.

ELECTRO-MOTIVE DIVISION · GENERAL MOTORS

LA GRANGE, ILLINOIS • *In Canada:* GENERAL MOTORS DIESEL, LTD., *London, Ontario*

World's Largest Builder of Heavy-Duty Diesel Engines and Electric Traction Equipment

Don't just buy Deezle Oil

See your Pure Oil salesman and be sure your lubrication problems are spelled out correctly. Then . . . . . .

BUY PURE DIESEL OIL

BE SURE PURE WITH PURE

1. **Pure Klondyke Series Lubricants**—Specially made naphthenic-type pale oils for slow-speed, two-cycle engines.
2. **Purodiesel Series Lubricants**—High-grade inhibited oils particularly suited for two- and four-cycle engines not in heavy-duty use.
3. **Purodiesel XD Series Lubricants**—Specially compounded for two- and four-cycle engines in mild heavy-duty operation.
4. **Pure Sultana X Series Lubricants**—Highly compounded heavy-duty oils for two- and four-cycle engines in high-speed, heavy-duty use.
5. **Pure Sultana SHD Series Lubricants.** Specialty oils designed for supercharged engines and engines operating on fuel with a high sulfur content.

PURE OIL DIESEL LUBRICANTS

Free Used Oil Analysis foretells engine trouble . . . saves costly repairs

Don't guess about the condition of the lubricating oil in your engine. A pint sample of used oil subjected to Pure's analysis system will permit our technicians to determine this and report to you any need for adjustments. To get this FREE Pure-sure Used Oil Analysis, send coupon today!

Offer limited to areas where Pure Oil Products are sold.

The Pure Oil Company, Dept. D-512
35 East Wacker Drive, Chicago 1, Illinois

Send me information on how I may obtain a Pure-sure Used Oil Analysis of my used diesel lubricating oil without cost or obligation.

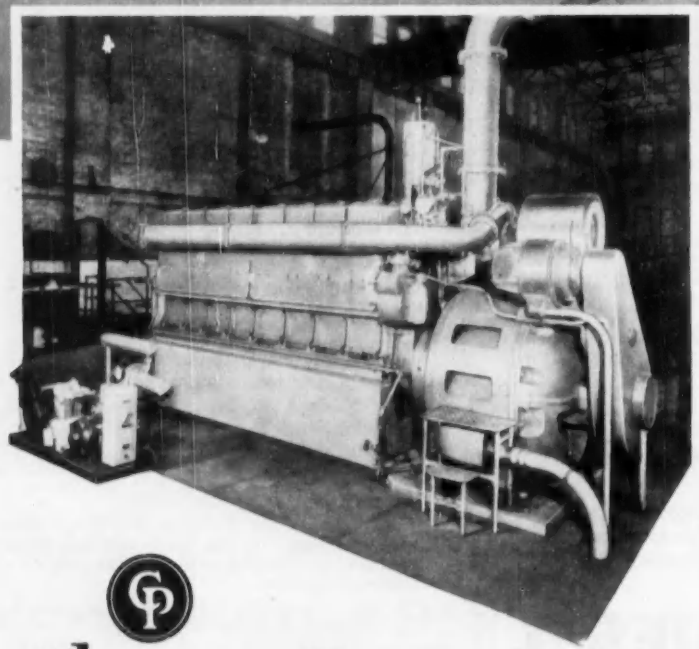
Name ..... Title .....

Company .....

Address .....

City ..... Zone ..... State .....

PERFECT "STAND-IN" WHEN POWER FAILS



When an emergency strikes, cutting off power in your plant, you can resume production immediately with a CP Standby Power Unit, eliminating losses caused by spoilage of materials and idle labor during power failures.

CP Diesel, Dual Fuel or Gas Engine Units in portable and stationary models are available in sizes capable of delivering 120 HP to 1750 HP and in normally aspirated or supercharged models. For more details, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

YOU CAN SAVE MONEY PURIFYING LUBE and FUEL OIL WITH A SHARPLES

Get the facts about the "15 minutes-to-clean" Sharples with the exclusive tubular bowl.

Write today for Bulletin 1264

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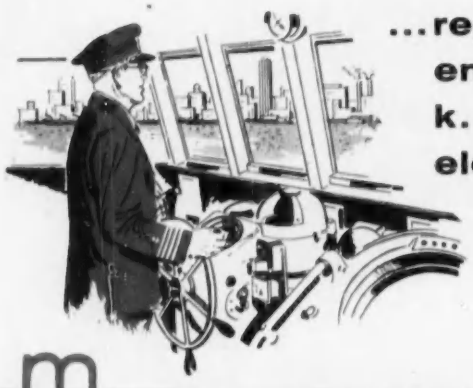
NEW YORK • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON
Associated Companies and Representatives throughout the World

Owner and Operator: Washington State Ferries, a division of the Washington Toll Bridge Authority.
Builder: Puget Sound Bridge and Dredging Co., Seattle.
Naval Architect: W. C. Nickum and Sons, Seattle.
Engines: Built by Cleveland Diesel Engine Division of General Motors Corp., Cleveland.

Marquette

HYDRAULIC GOVERNORS



...regulate the two 1600 h.p. propulsion engines and the two 8 cylinder 200 k. w. generator sets on the Diesel-electric Ferry "Evergreen State".

Marquette and Massey **GOVERNORS**

THE MARQUETTE METAL PRODUCTS CO.
1148 GALEWOOD DRIVE • CLEVELAND 10, OHIO
MASSEY MACHINE COMPANY, INC.
765 PEARL STREET • WATERTOWN, N.Y.

DIVISIONS OF CURTISS WRIGHT CORPORATION

After 199,000 miles service one user reports "no appreciable wear" in Ni-Resist protected pistons of Buda Model 844 heavy duty engine. Operator of 738 Diesel trucks hauling freight over the Rockies, he expects much more mileage before replacing pistons of this type. Conventional-type piston failed after 41,078 miles.

400% more mileage between overhauls

Less work to keep trucks rolling when top ring bands are Ni-Resist.

STOP NEEDLESS WORK . . . increase your mileage between piston overhauls up to five times and over.

Under your toughest conditions, try a set of aluminum pistons with bonded-in Ni-Resist* high nickel alloy cast iron ring bands. See for yourself how they practically eliminate ring groove wear.

You'll find that aluminum pistons with Ni-Resist ring carriers help to prevent blow-by and abnormal oil consumption. Because Ni-Resist inserts not only resist corrosion, but they also withstand heat and metal-to-metal wear. The result is a step-up in power and a big cut in downtime expense.

Ni-Resist alloy iron is one of industry's most economical materials. In fact, no other cast metal provides such a useful combination of engineering properties.

In addition to its use for ring carriers, this alloy is also used for cylinder liners, valve guides and exhaust system parts. If you are having trouble with any of these parts, we'll help you lick the difficulty. Fill in the coupon and mail it to us now.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

Gentlemen: We're having trouble with
☐ top ring grooves ☐ cylinder liners
☐ valve guides ☐ exhaust manifolds
due to ☐ heat ☐ corrosion ☐ wear

Name _____

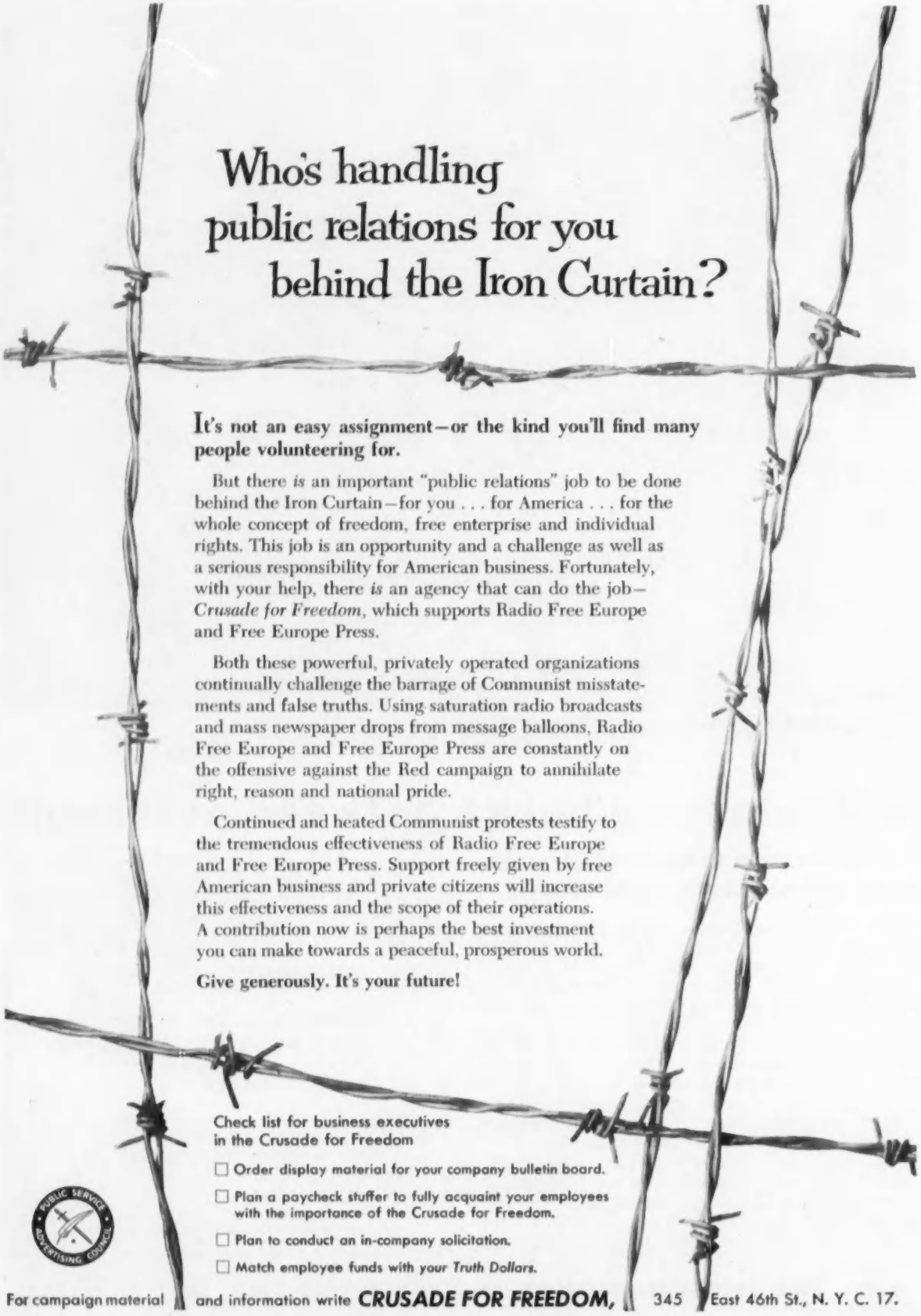
Title _____

Company _____ Address _____

City _____ State _____

☐ Please send booklet "Keep Them Rolling"

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.



Who's handling public relations for you behind the Iron Curtain?

It's not an easy assignment—or the kind you'll find many people volunteering for.

But there *is* an important "public relations" job to be done behind the Iron Curtain—for you . . . for America . . . for the whole concept of freedom, free enterprise and individual rights. This job is an opportunity and a challenge as well as a serious responsibility for American business. Fortunately, with your help, there *is* an agency that can do the job—*Crusade for Freedom*, which supports Radio Free Europe and Free Europe Press.

Both these powerful, privately operated organizations continually challenge the barrage of Communist misstatements and false truths. Using saturation radio broadcasts and mass newspaper drops from message balloons, Radio Free Europe and Free Europe Press are constantly on the offensive against the Red campaign to annihilate right, reason and national pride.

Continued and heated Communist protests testify to the tremendous effectiveness of Radio Free Europe and Free Europe Press. Support freely given by free American business and private citizens will increase this effectiveness and the scope of their operations. A contribution now is perhaps the best investment you can make towards a peaceful, prosperous world.

Give generously. It's your future!

Check list for business executives in the Crusade for Freedom

- ☐ Order display material for your company bulletin board.
- ☐ Plan a paycheck stuffer to fully acquaint your employees with the importance of the Crusade for Freedom.
- ☐ Plan to conduct an in-company solicitation.
- ☐ Match employee funds with *your Truth Dollars.*

PUBLIC SERVICE ADVERTISING COUNCIL

For campaign material and information write **CRUSADE FOR FREEDOM,** 345 East 46th St., N. Y. C. 17.

Woodward P G Diesel
Locomotive Governor

GOVERNOR ASSEMBLY

Woodward diesel locomotive governors are here shown being assembled in our shop. These shop men have been thoroughly trained and are specialists of production governor assembly. Their skills guarantee the high quality and dependable performance of our governors.

WOODWARD GOVERNOR COMPANY

Rockford, Illinois

WORLD'S OLDEST AND LARGEST MANUFACTURER OF HYDRAULIC GOVERNORS FOR PRIME MOVERS

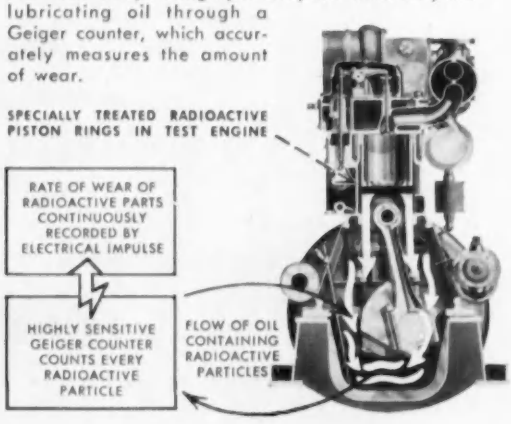
Putting atoms to work for longer engine life

ENTERPRISE BUILDS MORE DUTY INTO HEAVY-DUTY ENGINES

—Through radioactive testing and research

Discovering the secrets of engine wear — building more life into engine parts... these are challenges constantly put to the research staff at Enterprise laboratories. And today — thanks to the scientific application of radioactive testing — many of the mysteries of what happens inside an engine — of how and why parts wear, are being solved. Because of tests like these, new concepts have come to bear in diesel engineering — in metallurgy, piston design, operating speeds, types of fuel and lubricating oil, and many other phases. The results? More work from Enterprise Engines at less cost, with longer engine life than ever before. For the best in diesel, dual fuel, tri fuel and spark ignited gas engines, specify Enterprise — for 35 years the quality leader.

In Radioactive tests, engine parts such as piston rings are first irradiated in an atomic pile, then put in an Enterprise test engine. Any radioactive particles which are worn away during operation, are carried by the lubricating oil through a Geiger counter, which accurately measures the amount of wear.


SPECIALLY TREATED RADIOACTIVE PISTON RINGS IN TEST ENGINE
RATE OF WEAR OF RADIOACTIVE PARTS CONTINUOUSLY RECORDED BY ELECTRICAL IMPULSE
HIGHLY SENSITIVE GEIGER COUNTER COUNTS EVERY RADIOACTIVE PARTICLE
FLOW OF OIL CONTAINING RADIOACTIVE PARTICLES

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editorially speaking

Getting a Straight Story

Ever ask your kid what homework he has? Then you know what we're talking about. If you can get an answer straight enough to judge either the quantity or type of work, we'll present him with an award as the outstanding offspring of the year! Don't blame him, though; it might be hereditary. How are your answers? This "straight-story" problem arose in talking with the service manager of a large engine company. They are all out for product improvement but the trick is to get the straight dope on field complaints. Though spotty or conflicting, all must be tracked down to see if a sound basis for redesign exists. Here are some stumbling-blocks. First, there's the fellow whose belligerence is directly proportional to the guilt of his conscience. Companies are not interested in vocabulary or volume; they want facts. Then there is the innocent (or maybe not-so innocent) "front" for a coverup. We ran into a case in Mexico where some peons were given the job of keeping an engine supplied with fuel and lube oil. One day it stopped—but good! No one would admit to any action except adding lube oil. Investigation was made. Finally under threat of mayhem, the last adder-of-oil reinacted the crime. He put in oil okay—in the air intake! Or it could be the flange that just "broke" when the bolts were tightened. You check but the misplaced lockwasher behind the flange has mysteriously vanished. It's human; no one likes to admit a silly mistake. Then, contributing to spotty field reports is (of all things) the good mechanic. Cornered, he'll reply, "Yeah, it happened three or four times but I patched it up." While these and similar antics give manufacturers fits, they affect you too. Maintenance records are either inadequate or inaccurate and either way it costs you money. If you get a straight story, your maintenance will be better. Pass the straight story to the manufacturer and you get better engines. It looks like a good parlay.

B P E

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highlights

Diesel bulldozers help to start a new industry by making it economical to work over vast acreages of pine stumps left behind as deserted wastelands. These are sent to mills where turpentine, wood resins and pine oils are extracted. A relatively new industry is booming with the help of these diesel bulldozers.

First quarter diesel locomotive orders are expected to be higher than for the same period in 1955. This is based on an estimate submitted by all but five of 129 Class I line-haul railways. They anticipate an increase in equipment expenditures of about 111.3% over the first quarter of 1955. And diesel equipment is sure to be included.

Weighing whole locomotives with strain gauges in conjunction with load cells is now possible. This electronic device which can also be used to weigh entire trucks or trailers was discussed by R. D. Hornidge of B-L-H at an SAE meeting recently.

L & N R.R. orders 30 more diesel locomotives. When these are delivered to the Louisville & Nashville R.R., the total diesel units in service on this line will be 546. Of these, Electro-Motive Division has built 306. Our forecast of increased railroad diesel purchases in last month's Diesel Power is already beginning to materialize.

Logging and conventional highway diesel trucks made by Kenworth will soon be delivered to the firms that bought them. The four off-highway logging trucks going to the American Forest Products Co., are powered by 262-hp turbocharged diesels and will move about 12,000 board feet per load of logs. The eight, 2-axle highway transports joining the Frank L. Thomas fleet have 180-hp engines and will carry the legal gross payload of Texas, 58,240 lb of building materials.

American made buses for Canada are included in the biggest single bus order ever placed by the Montreal Transportation Commission. Among the 250 buses bought there will be 50 made by Mack Truck and 25 made by General Motors.

"Diesel-electric locomotive's overhauling to be done mostly by manufacturers eventually." That is the prediction of a General Electric Co. engineer. A demand for better performance has brought about more complicated machinery and with it the need for special tools and know-how to make repairs. Manufacturers claim that their well equipped shops and factory trained servicemen will do the best repair job and at the lowest cost in the long run. But the better equipped railroad shops will no doubt have a say in this matter.

Tests show that lube oil life is extended in vehicles where a sodium slug was put in the oil line. These tests were made by the National Research Council of Canada engineers who have developed the process. What they've tried to do is to prevent or slow up formation of the products of oxidation. One of the two vehicles being tested has completed over 17,000 miles, the other over 20,000 miles since Sept. 1953 and tests show that the oil is still usable.

Railroads go all out to get back passengers lost to other forms of travel. A 10-car, 400-passenger, light-weight Aero-Train, developed by General Motors will be operated by the Pennsylvania Railroad between New York and Pittsburgh on daily basis beginning Feb. 6. This diesel powered train can travel at 102 mph. When Boston & Maine Railroad receive the 34 Budd Highliner cars which they just ordered they will be completely dieselized. They will then have 101 of these air-conditioned, stainless steel cars.

Maintaining St. Louis Buses

Superior maintenance helps St. Louis Public Service Company to insure safety and on-time scheduling of 1020 buses. Power tools and good handling facilities cut job time and helped to win 10th consecutive award as country's best operated bus shop.

TODAY the pressure is on the public transportation industry, and has been for the past ten years. In major city after major city the number of passengers carried per year by buses, street cars and subways has been steadily decreasing, operating costs have been mounting and profits (if any) have been steadily dwindling. Many major cities in the United States have come to expect public transit facilities to operate in the red.

The St. Louis Public Service Co. of St. Louis, Mo., is a good example of what the industry as a whole is doing and can do to win back the lost passenger. It is easily one of the most progressive transit companies in the country as its record of post-war success testifies.

On the service end, St. Louis Public Service developed what it calls the "spotlight formula" to gear its service to eliminate as many trips as possible where use of the family car has advantages over public transit. This involved 11 different express routes catering to rush-hour traffic, mid-day shoppers, baseball fans and summer opera patrons; three "Park-Ride" routes where the commuter parks his car free of charge at the outskirts of the city and takes a non-stop transit bus to his destination; two loop routes in the downtown section and special reduced fares for shoppers made possible through the cooperation of downtown merchants who assume part of the costs.

St. Louis Public Service does not stop here, however. Its fleet of 40- and 50-passenger General Motors and Mack buses, almost all diesel powered, are among the most attractive in the industry.

Maintenance—The Back Bone

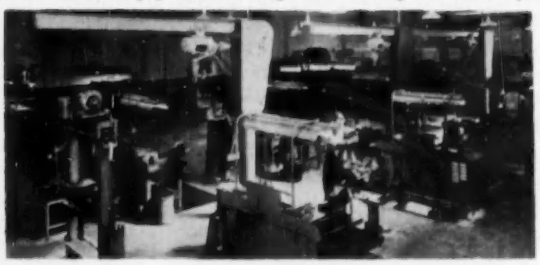
The average age of the fleet is seven years; each bus is painted inside and out at least once every three years and each is washed and vacuumed at the end of each day's operation. Emphasis in maintenance is on prevention, an approach that the company has found achieves major cost savings. The first comprehensive preventive maintenance program was undertaken in 1928 and, within three years had cut per-unit maintenance costs for the entire fleet by more than 34%.

The St. Louis Public Service's maintenance facilities consist of a centrally located general overhaul shop, five operating division garages, a small shop for utility trucks and a centralized equipment office.

At the five garages, some 200 employees, working a 24-hr schedule, handle all servicing, cleaning, inspecting, light repairing and dispatching for the bus fleet. At the end of each day the buses are refueled; oil, water and tires are checked; the buses are washed and vacuumed; and drivers make out formal reports citing unusual operat-

Machine shop is at left and engine rebuilding section at right. Jib cranes on swinging I-beam assemblies facilitate heavy lifting chores.

Special cradles and hoists in the transmission and differential section makes equipment handling and working an easier job.



ing conditions. Mileage checks, controlled by clerks at the equipment office, where files contain a complete history of all major equipment, are conducted at the garages at the end of every 1500, 3000, 9000 and 27,000 miles.

Any defective equipment discovered as a result of these inspections, or on the basis of drivers' reports, is sent to the general overhaul shop for major repair. In addition, in order to catch a defect before it can cause a service breakdown, all major units, such as engines, turbines and differentials are removed and sent to the general overhaul shop after every 130,000 miles of operation.

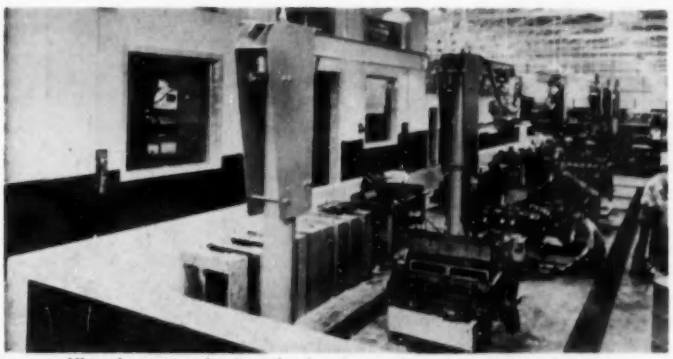
The general overhaul shop covers several city blocks in area and is divided into separate sections, including body repair and metal fabrication, engine rebuilding, machine shop, unit overhaul, electrical, welding and painting. The work is arranged on a production line basis in each section, the men specializing in different phases of overhaul according to their respective skills.

It is definite policy to provide mechanics with tools and facilities of type and quality to promote the best possible workmanship. For each mechanic there is an individual work bench, equipped with air hoist, power tools, hand tools and compressed air line.

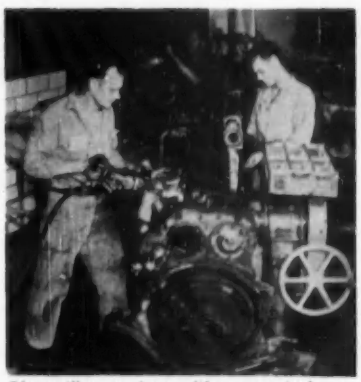
The production-line arrangement of the general overhaul shop was designed to move equipment through as quickly as possible, without sacrificing attention to detail. In this way unit labor costs are reduced to a minimum and the company's buses are kept rolling at maximum availability. This need for both speed and dependability is one reason for the widespread use of compressed air throughout the shop. Air motors, with their simplified design and few working parts, stand up well under heavy-duty conditions. They can operate for extended periods at overload capacity without danger of burning out. They require virtually no maintenance. For example, one of the 4000-lb capacity Ingersoll-Rand air motor hoists in the engine rebuilding department has been in continuous service for more than 10 years without replacement or other maintenance. Installed in 1945, it has never been removed for any reason from its 360-deg swinging I-beam suspension.

In addition to industrial air motor hoists, which range in capacity from 1000 lb to 6000 lb, air is used to power a wide range of tools, including heavy-duty wrenches, hammers, riveters, sanders and drills. It is used for paint spraying and for blowing dirt off equipment to be repaired. With power tools, two men can start work on a disabled bus in the morning, remove the engine, turbine and clutch, install a replacement engine plus all auxiliaries, and have the fully repaired bus back in service by 4:30 that same evening, in time for its regularly scheduled run.

Of the 35 power-driven hoists in the shop, 24 are air motor-driven and eleven are electric-driven. The electric hoists are of 500 lb and 1000 lb capacities and are used mainly as standbys, on weekends and evenings when the big compressors are shut down. All 24 air hoists are Ingersoll-Rand units, suspended from swinging I-beam assemblies and traveling on articulated-type, ball-bearing trolley mountings which equalize the load on four wheels. All power tools are also Ingersoll-Rand, ranging in size from a Size 534 Impactool, capable of removing bolts of up to 1¼-in thread size, down to a small size of OK Multi-Vane Drill, weighing less than two pounds and designed for drilling up to ¼-in in steel.



All equipment coming into the shop for repair must go first to the tear-down room where the unit is inspected and it's history checked.

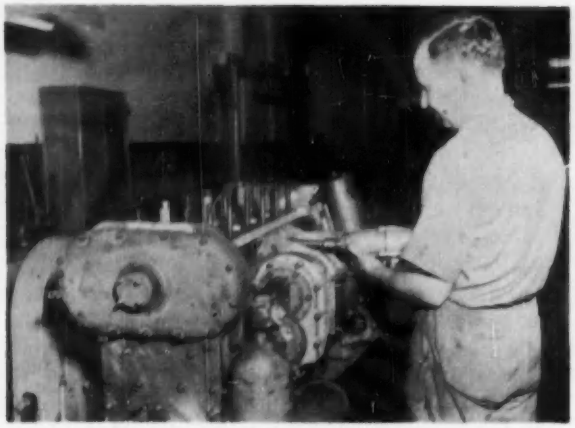


Dismantling engines with power tools requires 1/10th the normal hand-tool time.

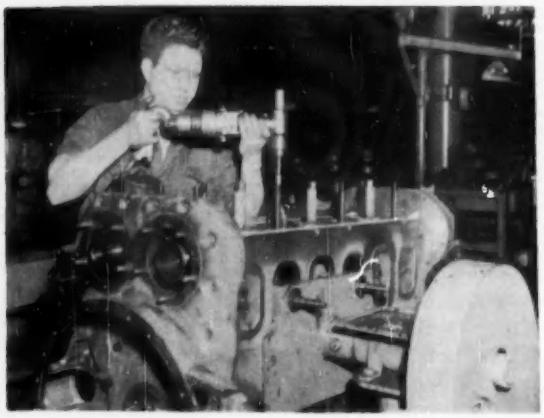
Normally, all heavy units such as transmissions, differentials and radiators arrive at the general overhaul shop by truck and are unloaded in the receiving department by a 2000-lb air hoist. Each unit is wheeled in a hand truck to the tear-down room, where it is lifted to a workbench or lowered into a special cradle by a 6000-lb air hoist or a 1000-lb air hoist. Two smaller electric-driven hoists are also used in this room.

In the tear-down room the unit's history is checked. A brass tag riveted to the unit carries its serial number, its date of purchase and the date of its last overhaul. After this brief initial inspection, covers are removed, the unit is again lifted by air hoist and sent to the shop's wash room.

Three important factors in good maintenance, according to St. Louis Public Service are good tools, good clean work clothes and a clean shop—which includes clean equipment. Give two identical engines, one coated with grease and grime and the other carefully cleaned, to two mechan-



Major engine repairs are handled in engine rebuilding and machine shop departments. Blower is removed for repair in rebuilding section.



Cylinder liners are honed quickly and accurately in engine rebuilding section with a multi-vane angle wrench.

ics of equal skill and the mechanic working on the clean engine will do a better repair job in less time. This is the reason why all equipment is sent to the shop's wash room before any work is performed on it.

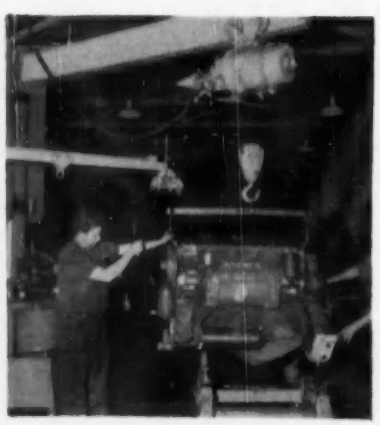
In the wash room, the unit is lifted by one of six air hoists, including two 2000-lb hoists and four 1000-lb hoists. If the unit is to be immersed in one of the room's two vats, it is lifted by a 2000-lb hoist and lowered into a solution of Wyandotte, Pennsalt or Macco cleaner, maintained at a temperature of 180°F. If it is to be cleaned by steam gun, containing the same type cleaners, it is suspended over a drain by one of the four 1000-lb hoists. Fumes generated by the cleaners are quickly removed through the ceiling by means of 10-hp exhaust fans.

Once the unit has been thoroughly cleaned, it is sent back to the tear-down room for inspection. Here all parts are carefully checked for defects and wear and are channeled out to other sections for repair. The tear-down room is the hub of the entire shop. Because all incoming equipment must pass through this room for inspection, the work load is always heavy. Hundreds of nuts, bolts and studs have to be removed every day. For this reason the men are equipped with three Impactools, a Size 508 for bolts up to 5/8-in, a Size 514 for 3/4-in bolts, and a Size 534 wrench for 1-in bolts. In addition, two size 2H air drills of 3/8-in drilling capacity, with wire brush attachments, are used to clean out carbon from cylinders and pistons.

With these heavy-duty tools, the inspectors in the tear-down room are able to keep equipment moving to other sections at maximum speed. Ordinarily a GM 671 diesel engine can be torn down completely in from nine to ten hours, with top speed as low as eight hours. Original parts or necessary replacement parts are put in a tray which moves with the block. Thus a man on the rebuild line gets the block and all its parts in orderly, convenient form.

From the tear-down room, the unit may go to the engine rebuilding department, the cylinder block and head department, the fuel department, the turbine and differential department, the hydraulic and air department, the electrical department, the machine shop, or to the radiator, brake, welding or salvage department. At each department a permanent record is kept of all repairs completed and this record is returned with the unit to the point of origin. The work is subsequently filed in the central equipment office.

If the unit leaving the tear-down room is an engine, normal procedure is to send it first to the cylinder head and block department to be tested for water leaks. Here the engine block is lowered into a special stand by a 1000-lb I-R air hoist and a Size 508 I-R Impactool is used to remove the cylinder head and replace it with a head plate for pressure testing. The block is filled with water and carefully checked for leaks. At the completion of this test, the 5/8-in capacity Impactool is again used to remove and replace the head plate and the unit is sent to the proper repair department.



Fully-rebuilt diesels are completely checked and tagged and all openings closed off pending installation.

The Shop In General

Facilities and equipment are available at the overhaul shop to rebuild a 50-passenger bus completely. The only operation not handled is crankshaft grinding because there are so few shafts needing regrinding that the high cost of a grinder would not be justified. Otherwise, everything from reboring a cylinder to straightening a bumper

is done directly in the shop. At present the overhaul shop is handling salvage and rebuilding work for other transit companies in different parts of the country.

Major engine repairs are handled in the engine rebuilding and machine shop departments. In the engine rebuilding department, there are five workbenches, with a 4000-lb air hoist over every bench. These hoists are often used to raise and lower an entire engine assembly, weighing over 3000 lb. To remove the countless bolts from cylinder heads, timing gear covers and other engine parts, the men are equipped with individual Size 508 I-R Impactools. In this way they spend less time on nut running and more time on the precision work for which they have been trained. In addition the men are equipped with I-R AVC 12 riveting hammers, capable of handling ¼-in rivets, and with a Size 28M angle wrench, the men are able to work from a normal position, eliminating fatigue and increasing efficiency—particularly during late afternoon hours.

In the machine shop, there are four lathes, the largest having a 24-in swing and 12-ft base; a Van Norman surface grinder; a Heald Co. grinder; a Lempco piston grinder; a Barnes drill automatic honer for cylinder blocks and sleeves,—capable of boring and honing six cylinders in two hours, and a Weston Machinery radial drill, for fly cutting crankcases, boring out water holes in cylinder blocks and other general drilling uses. Over each lathe is a 1000-lb I-R air hoist for handling material.

Heavy nut-running assignments are part of the daily job in the turbine and differential department. On a single turbine there are more than 60 bolts of various sizes that have to be removed and replaced during a routine overhaul. Again compressed air is used to save valuable labor time on such jobs. Size 508 Ingersoll-Rand Impactools are used on all bolts up to ⅝-in thread size and a Size 534 is used on bolts up to 1¼-in thread size. The rear end of a modern bus can be completely overhauled in this department in a maximum of five hours. Three 1000-lb I-R air hoists handle all heavy lifting chores.

Brake department equipment includes two Lempco drum lathes and a pair of Size 534 air Impactools to pull the big wheel lugs.

Compressed air is also used to power two Size 3F Ingersoll-Rand sanders, two AVC 13 riveters and an AV12 riveter in the body shop. Air outlets are available at all workbenches, as well as in the shop's 12 pits. These fluorescent-lighted pits are used for engine overhaul, change and service. They are equipped with pipes which drain oil to an outside tank and with a blower to remove exhaust gas.

Compressed air for all tools and for general shop use is supplied at a cutoff pressure of 100 lb by two Ingersoll-Rand compressors, one of which operates continuously from 7 am to 4 pm and another which acts as a standby, starting at 3:30 pm and shutting down at 4:30 pm. The main compressor is a 17 x 14, 10½ x 14 Type 10 Imperial unit, driven by a 150-hp motor. The standby unit is a 15 x 12, 9¼ x 12 Type 10 Imperial unit, driven by a 105-hp motor. This heavy-duty compressor has been in steady service since 1923.

Summary

This has been just a capsule description of a large, complex shop, its careful organization and varied equipment. Several departments have barely been mentioned, some not at all. The purpose has been to outline the factors that make a prize-winning shop, to indicate the thoughtful planning and exacting supervision required in such a shop. Finally, the purpose has been to describe the role of compressed air and air-driven equipment in keeping St. Louis Public Service's 1020 buses worthy of the "spotlight".

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 77 to check them.

1. When dropping from full gas load to part gas load on some dual-fuel engines, better fuel economy is obtained by:
   a. Retarding the injection timing of pilot oil.
   b. Advancing the injection timing of pilot oil.
   c. Keeping the injection timing constant for the pilot oil.

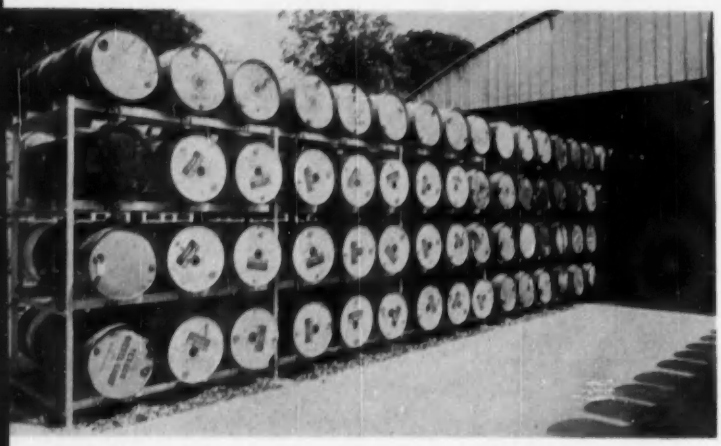
2. The primary function of the displacer piston built into some of the fuel injection pumps used on dual-fuel engines is to:
   a. Vary the amount of fuel injected according to the changes in load.
   b. Permit a longer plunger stroke to avoid some port control problems inherent in very short effective strokes.
   c. Compensate for the leakage factor in the fuel injection pump.

3. The amount of fuel oil injected in a straight diesel engine at idling is about.
   a. Twice that of the pilot oil injected in a dual-fuel engine of the same output.
   b. Three times that of pilot oil injected in a dual-fuel engine of similar rating.
   c. The same as the amount of pilot oil injected in a dual-fuel engine of the same power.

4. One of the more common ways by which diesel engines in the field are being uprated is by:
   a. Inserting larger-bore sleeves.
   d. Increasing the speed.
   c. Increasing the compression ratio.

5. In the field, the proper reason for uprating a diesel engine which constantly operates under an overload condition is to:
   a. Permit the owner to put a heavier load on the engine than it is now pulling.
   b. Increase the engine life and lower the maintenance costs.
   c. Give the engine reserve power so that it will not lug under the present load conditions.

6. One of the principal maintenance costs on mechanical lubricators is:
   a. Servicing sight feed glasses.
   b. Cleaning and overhaul of lubricator parts.
   c. Replacement of worn parts.



Laying unprotected oil drums on their sides on a metal rack is recommended practice for storing outdoors. Each position is numbered to avoid error.

Oil is being transferred from original large drum to smaller container by means of a transfer pump.

Storing and Handling Lubricants

By Dr. R. K. Gould

Technical & Research Div. The Texas Co.

How you care for lubricants between their receipt and their application may mean the difference between dollars in your pocket or dollars down the drain.

MANY things can happen to a lubricant between the time it is received and when it is applied. For example, such things as careless handling, contamination, confusion of brands, exposure to extreme temperatures, and leakage can result in damaged equipment, excessive maintenance cost, lost production, loss of lubricant, fires, and accidents.

Loss of lubricant from damaged containers, loose fitting plugs, or careless handling (spilling) represents oil that you've paid for but will not be able to use. You certainly would not expect your supplier to furnish you with drums that were only partly filled. Furthermore, you would never deliberately pour a portion of lubricant down the drain. Yet the final result would be the same as when lubricant is lost through careless and improper handling—it all adds up to waste.

Also serious are the safety hazards created by the spilled material. A lubricant is designed to reduce friction between two parts in contact, but not when one of the elements is the sole of a shoe and the other is the floor. Many bruises and broken bones have been caused by falls on oil-slick floors. Spilled oil also creates a fire hazard, particularly in certain areas.

Thus, in the interest of both economy and safety, loss of lubricant through leakage and mishandling should be kept to an absolute minimum to avoid accidents etc.

Contamination

Contamination of lubricants with foreign material is also something to be avoided. All contamination is undesirable, but the extent of damage that results will vary, depending upon the type of lubricant and nature of the contaminants. In general, lubricants that contain additives will be affected more adversely than will straight mineral oils.

For example, a little moisture will not result in permanent damage to straight mineral oils. They may become cloudy but will clear up after standing, as the moisture settles to the bottom. Certain additives, however, may be water sensitive, and may be removed partially or completely by contact with just traces of water.

Contamination with dirt, dust, or other solid bodies can be especially harmful if not discovered in time. Not only do these materials accelerate oil oxidation and result in a shorter oil life, but also because of their abrasive properties, they can cause serious damage to the lubricated moving parts.

At best, contamination can cause extra handling if discovered before the lubricant is used (filtering out solid particles or allowing water to separate). Furthermore,

contamination may permanently destroy some of the important properties of certain additive-type lubricants—properties which are essential for satisfactory lubrication of the equipment where the product is to be used.

Extreme Temperature Storage

Exposure of lubricants to either abnormally high or low temperatures can result in temporary or permanent damage, depending on the nature and composition of the product. Again, it is additive-type products which are most subject to harm.

Of the two extremes, contact with low temperature is by far the more prevalent due to outdoor storage of lubricants in areas where winter weather becomes very cold. Soluble oils are examples of products that can be affected adversely by sub-freezing temperatures. Lubricants containing fatty materials are other examples.

If nothing worse, lubricants and greases stored in cold areas become viscous and stiff, and in such condition they are very difficult to handle. Various means are commonly used to raise the temperature of the materials some of which are not to be recommended. Where direct heat is applied, there is always the danger of developing local overheating which may ruin the lubricant. Exposure of greases to high temperatures may result in separation of the oil and soap, making them useless.

These are merely some typical examples of what may happen to lubricants when exposed to temperature extremes. In the interest of maintaining the initial properties of the products, particularly those containing additives, it is wise to protect them from excessively high or low temperatures during storage.

Mixing

To a good many people, oil is oil, and one is just the same as another. The properties of lubricants and the requirements of the equipment mean little or nothing to some operators, and upon finding need of lubricant, they may use whatever material is nearest at hand, especially if it "looks right".

Obviously the chance of this occurring is slight in a plant where the handling, dispensing, and application of lubricants is centrally controlled and is supervised and administered by qualified personnel. However, this is not always the case, and the indiscriminant mixing of types and brands of lubricants does occur, sometimes with very serious consequences.

Handling Suggestions

Every plant, regardless of size, has a problem by the mere fact that they must store and handle lubricants. Because no two plants are exactly alike and because numerous local factors must be considered, the problem is more or less specific for each individual plant. However, there are some basic rules and some "do's" and "dont's" which apply to all storage and handling operations, and which should be observed. Some pertinent suggestions follow.

Most lubricants are delivered to the consumer by train or truck so:

1. For easiest and simplest handling of drums, there should be an unloading platform level with the truck or freight car.

2. If there is no unloading platform, use a ramp and slide drums endwise to ground level, or use a lift truck.

3. Do not drop drums from truck or freight car to a cushion, such as rubber tires. Drum seals can be split and leakage will occur.

4. Simple rolling of drums is satisfactory for transferring drums short distances.

5. For long distance transfer, hand trucks, lift trucks or metal tracks place less strain on the seams.

Storage

1. Choose storage area carefully. Select a central location so that hauling distances are as short as possible. Also select an area where the atmosphere is free from dust and vapors.

2. Store lubricants indoors if possible—chances of contamination will be less.

3. If stored outdoors, drums should be placed on their side and on racks—don't lay them on the ground. When placed on end, rain water may accumulate and be sucked into the drum by the normal breathing action. If stored outdoors on end even temporarily, cover should be available to place over drum during inclement weather.

4. Indoor storage area, whether a separate building or a shared space, should be fire-proof, have brick, tile or concrete walls and floors, and be fitted with suitable drains. Woodwork, in addition to not being fire-proof, is more difficult to keep clean.

5. Cleanliness is essential regardless of whether storage is indoor or outdoor. For indoor storage, area should be painted in light colors, preferably white. Maintain regular cleaning schedules.

6. Orderliness is another must. By keeping different brands and types of lubricants separated and in their proper places, there is less chance for error.

7. Don't store more products than necessary. The lubricant supplier will be glad to make a survey of lubrication requirements with a view to keeping the number of different products to a minimum. This also will reduce chances of confusion.

8. Exercise extreme care in heating products that have been exposed to low temperatures. If possible, transfer drums to a warm area and allow product to reach room temperature. If more rapid heating is required, use exhaust steam. Never apply direct heat, such as a flame, to exterior of the drum. This would melt the sealing compound and cause leaking. It might also harm the product.

9. Remember that exposure to temperature extremes can damage lubricants. If there is any reason to suspect that this condition has occurred, examine the lubricant before using. If the product appears abnormal, consult the lubricant supplier as to what to do. The lubricant may have to be discarded or it may be salvaged.

Dispensing

1. Whether the plant be small or large, dispensing of lubricants should be supervised by personnel thoroughly familiar with lubricants and lubricant requirements. This is a vulnerable link in the chain of operations that connect the source of lubricant with its application.

2. Actual mechanics by which the lubricant is transferred from its storage container to the point of application and the transfer equipment used will depend upon the particular plant involved. Transfer pumps are available which fit the standard grease or lubricant drum and permit the product to be removed from its original container with no danger of contamination, waste, or mess.

By means of such pumps, lubricants can be transferred to smaller units such as portable power guns, hand guns, or small containers, and thence to the point of application.

Schemes can be devised for applying lubricant directly from the drum, thus eliminating the intermediate transfer operation. For example, a drum equipped with a pump, hose, and control valve can be mounted on a dolly and brought directly to the spot where the lubricant is needed. Also a system can be devised whereby the lubricant is piped from the drum to the area where it is required, and hoses connected to the pipe outlets carry the lubricant directly to the point of application.

3. All equipment used in transferring lubricants should be located in a central spot and should be kept clean.

4. Where many different lubricants are used, a simple code system can help avoid confusion. The code, whether it be alphabetic or color (be careful of color-blindness) should be clearly evident on the drum, the transfer equipment and the point of application.

5. Keep accurate records of the lubricants used and use old stock first.

6. Keep oil-dispensing area clean—don't let spilled or drip oils accumulate—they are a safety hazard.

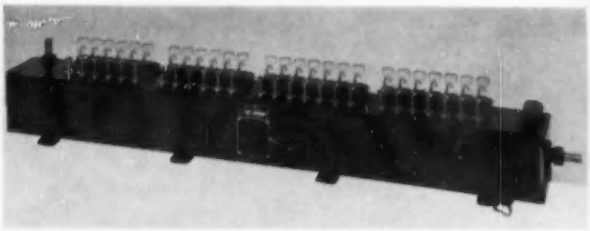
7. Keep fire protection equipment handy.

Summary

Petroleum suppliers takes every precaution necessary to assure that the lubricants are in the best possible condition when delivered to the customer. Users, likewise, should exercise equal care to see that when the lubricant is applied, it is in the same good condition as when it was received.

Normally, lubricants are not prima donna products which require unusual care. However, there are certain things that can occur during storage and handling which lead to waste, cause safety hazards and may render the lubricant ineffective, thus resulting in lubricant failure, increased maintenance cost and lost production. It is first necessary to recognize the bad practices and then take the rather simple, precautionary measures to avoid them.

With this accomplished and with qualified personnel in charge of handling lubricants, there is every assurance that the lubricant will be in good condition when applied.



Sight-Feed Lubricator Without Liquid

IF you're plagued with the nuisance of clouded sight glasses and excessive maintenance on your lubricators, a new vacuum type unit may be the solution. Manzel, a division of Houdaille Industries Inc., has solved the sight feed problem by actually eliminating the liquid in the sight glass of this unit.

The fact that this unit is interchangeable with regular tubular and bullseye feeds on other Manzel lubricators makes it even more ideal as a replacement. When installing this unit as a replacement, it is not necessary to rework the reservoir or remove the old lubricator from the engine.

Vacuum Unit Vs Liquid Sight Feed Type Lubricator

By use of a vacuum type pumping unit, Manzel claims to have practically eliminated the maintenance on the lubricator except for normal wear. Naturally, this is a big thing in diesel plants where they have lots of lubricators to service and maintain. Manzel has also eliminated the joint between the sight feed and the cylinder which of course has always been a problem in their other type lubricators.

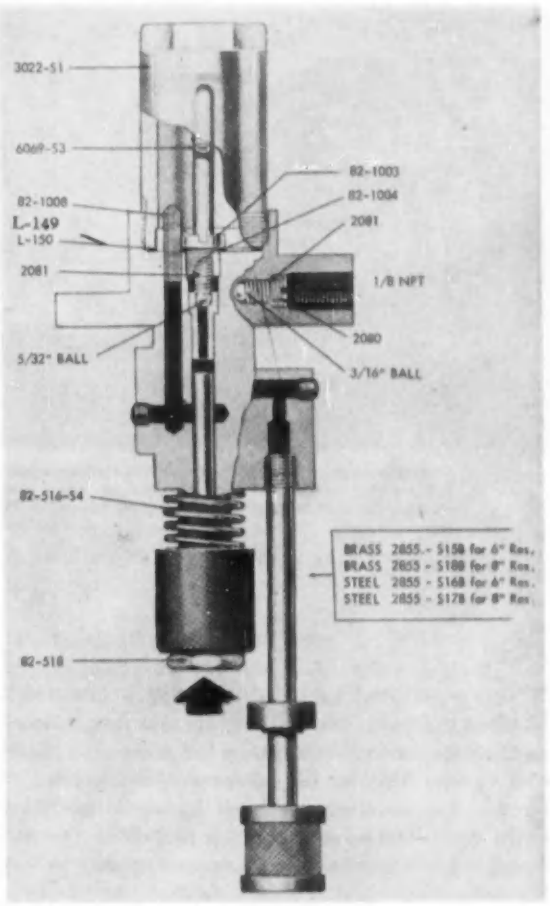
Another improvement over their other models is the elimination of several parts while maintaining the accuracy of delivery demanded. In fact, even better adjustment can now be obtained on the individual pumping units because there are no liquids in the sight glass to influence the size of the drop. A much more even and uniform drop size is maintained constantly.

Other advantages include reduced maintenance costs since no fluid is required and therefore there is no necessity for replacing it from time to time. Also, light colored oils are readily visible. As for the—

Principle of Operation

The rate at which the oil is being pumped is indicated by the flow out of the drip tube in the sight chamber. This

Cutaway of new vacuum pumping unit which is interchangeable with earlier models.



Vacuum-type mechanical lubricator pumping unit without sight-feed liquid is interchangeable with earlier models. Performance is improved and sight glass maintenance eliminated.

flow is caused by a vacuum created within the sight chamber during the suction stroke of the pump plunger. At this time with the plunger on its down stroke, the oil flows up through the filter, through the drip tube, passes to the bottom of the sight chamber and through the inlet port into the cylinder above the plunger. On the discharge stroke, the plunger passes the inlet port, seals it off and forces the oil trapped above it through the delivery tube connected to the point to be lubricated.

With this type of construction, any leakage of oil around the plunger due to wear, will cause the oil to flow to the point of lowest pressure which is the sight chamber. Consequently, any leakage will be indicated by a reduction in the rate of flow from the drip tube. This unique design has the drip tube connected to the suction tube and no check valves are in the suction line. As a result, the sight chamber is always under less than atmospheric pressure during operation.

One of the fine advantages claimed for the lubricator is that regardless of how small the setting is for the oil delivery, the plunger stroke remains the same. In other words, to change the volume of oil delivered only the position of the plunger in relation to the inlet port is changed. The plunger always takes a full stroke no matter how much oil is delivered. According to Manzel, much more accurate settings are obtained in this way than in their other lubricators.

The feed regulation of the vacuum type pumping unit is the same as with the liquid type of feed. By turning the feed regulator to the right or left, more or less oil will be delivered. The delivery of smaller units with smaller plungers can actually be cut down to about a sixth of a drop per plunger stroke and maintain these accuracies.

Importance of Accurate Delivery

Not only is it necessary that a suitable high-grade oil be used, but correct application is a matter of vital importance. It is essential that the oil should reach the cylinders with unfailing regularity and that it be delivered at the proper point in the piston stroke. Manzel says their new unit will do this better than their older lubricators.

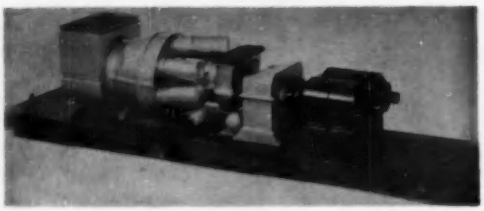
It is equally important that the correct amount be supplied, for an insufficient supply will soon result in scored cylinders and/or excessive wear. Overfeeding on the other hand, will cause the formation of carbon and the gumming of piston rings and valves.

Conclusion

Judging from the fact that over 5000 individual Model 82V vacuum pumping units are already in field use and that some large manufacturers have standardized on this type unit, it is safe to assume that this new lubricator is fulfilling its claims and making a big hit.

Therefore, if your plant is experiencing difficulty with visibility and excessive maintenance on lubricator sight glasses, elimination of the liquid in the sight glasses may be the answer to lower costs with greater dependability. Especially since it can easily be inserted in place of the other type Manzel pumping units.

Leading section of locomotive contains cab, controls and auxiliary diesel generator set. Trailing section has gas turbine unit remotely operated by controls and auxiliary systems in the cab.



Union Pacific Buys Larger Gas Turbine-Electric Locomotives

TO expedite handling of its expanding freight traffic, Union Pacific has ordered 15 new gas turbine-electric locomotives. At the time the order was placed with General Electric, UP announced its intentions to purchase two additional blocks of 15 locomotives each.

The new 8500-hp locomotive will be built in two permanently-coupled sections, with an engineman's cab at one end. A fuel tender will be coupled behind the locomotive. Overall length including the tender will be 165-ft 8½-in. Height will be 16-ft 2-in. Geared for freight service it will have a top speed of 65 mph.

The leading section contains operators cab, controls, and the auxiliary diesel plant necessary to operate locomotive. The trailing section contains main power plant which is remotely operated by controls and auxiliary systems located in the leading cab.

Fuel tenders are being built by the Union Pacific. They are used to keep the weight on driving wheels constant instead of losing weight and tractive power as the fuel is consumed. Tenders are 46-ft 5½-in long.

Gas turbine-electric locomotives pack a large amount of power into a comparatively small space, require no water, and have fewer moving parts than other types of similar horsepower.

In terms of locomotive length, the 8500-hp turbine output is about 51 hp per foot (including tender) compared with 35 hp for a modern diesel-electric freight locomotive. General Electric will build the huge locomotives at its Erie, Pa., Works. They are scheduled for delivery at the rate of two a month beginning about May 1957.

Currently the Union Pacific has in service a fleet of 25 gas turbine-electric locomotives rated at 4500 hp. These units went into service from February 1952 to October 1954, and were also built by General Electric at Erie.

The 4500-hp locomotive has a single cab, 83½-ft long. (See DIESEL POWER June 1953 page 54), and eight motored axles with the total weight of 551,720 lb all on the drivers. It is capable of pulling 5000-ton trains on a 0.82% grade without help.

Collectively, this fleet of 25 turbine locomotives average approximately 110,000 gross ton-mi per freight train. Average turbine hours per month is approximately 400 with overall availability being 80%.

Changes incorporated in the new 8500-hp locomotive as compared with the older 4500-hp units are designed to give increased reliability, efficiency, and reduced maintenance.

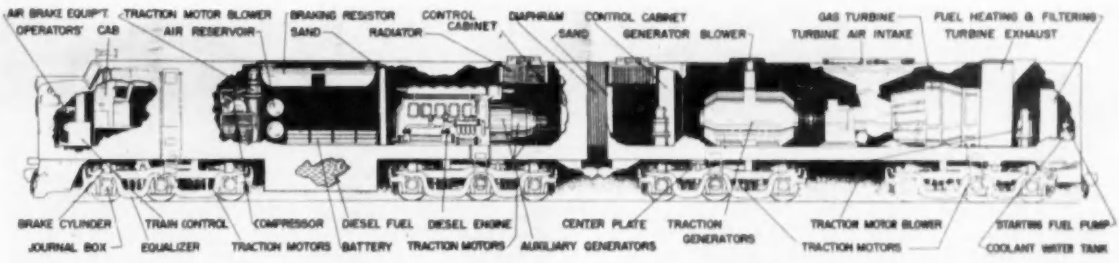
Simplification

A simple traction motor ventilating system, and improved arrangement for traction motor cables are made possible by the elimination of a span bolster not needed with the simplified running gear of the 3-axle trucks. In addition, two extra feet of height will be available for the apparatus cab.

The steam generator with its auxiliaries has been eliminated as it is not needed on this freight model. Fuel is kept warm in the insulated fuel supply tender. Simplified and improved control and mechanical systems, which have fewer pieces of mechanical apparatus, fewer electrical machines, and less control devices and contacts than a 7000-hp 4-unit diesel-electric locomotive, result in increased reliability and decreased maintenance.

Design Advances

An auxiliary power plant supplying all auxiliary pow-



er, elminating two turbine-driven auxiliary alternators and much switching control equipment used on the older turbine locomotives, together with reduced turbine idle speed will reduce the rate of fuel consumption of the new turbines. A 1000-hp locomotive-type diesel engine-generator set will supply all auxiliary power. This includes battery charging, cooling fans, traction motor blowers, air compressor, lights, controls, dynamic braking operations (excitation is controlled from this source only), main power plant running conditions, hostling, and moving the locomotive at slow speeds in yard maneuvering.

Positive ventilation of sealed main generator compartment with clean dry air should increase insulation life and reduce the possibility of flashovers. Greatly improved accessibility for maintenance by the elimination of some apparatus, improved arrangement of other equipment, and providing additional equipment space, will assist in easier maintenance.

Main fuel supply, treated Bunker "C" fuel oil, will be carried in the 24,000-gal tender, which is insulated with 4-in of glass wool. Fuel will be heated to a temperature of 110°F to 200°F before it is placed aboard the tender. This insulated carrier has been designed to keep the fuel warm for long periods of time.

A new design of turbine combustion chamber has longer length, improved accessibility, and easily removable cross fire tubes, and is expected to provide longer life. A fly-ball type mechanical governor used successfully in thousands of steam turbines will be employed to provide simplicity of operation, long life, reliability, easy adjustment, and low maintenance cost. The use of a gear-type fuel pump and flow divider fuel system should simplify maintenance and give high reliability. Highly reliable, economical operation together with improved fuel combustion should result from the improved combustion chamber and fuel nozzle design.

Operating Costs

It is estimated that the new turbine-electric locomotive will have approximately 25% less mechanical repair cost than that of a 7000-hp diesel-electric. It is also estimated that there will be economies in electrical, mechanical and power plant repairs.

In fuel consumption the diesel-electric will show an advantage over the turbine units, but considering the lower price of Bunker "C" oil based on the horsepower produced, the cost is about equal. Even on lubricants and wages, the new gas turbine-electric is expected to show advantages over comparable diesel-electric units.

A comparison based on thousand gross ton mi per train hr shows the new gas turbine holding advantage over the diesel-electric. According to General Electric officials, the new gas turbine-electric locomotive is designed for more gross ton mi per freight train hr at lower operating cost.

In General

Rating of the gas turbine power plant is 10,700 hp at 1000-ft elevation and 80°F. At the ambient conditions of 6000-ft elevation and 90°F the power plant will produce 8500 hp input to the generators for traction which corresponds to 7000 hp at the rail.

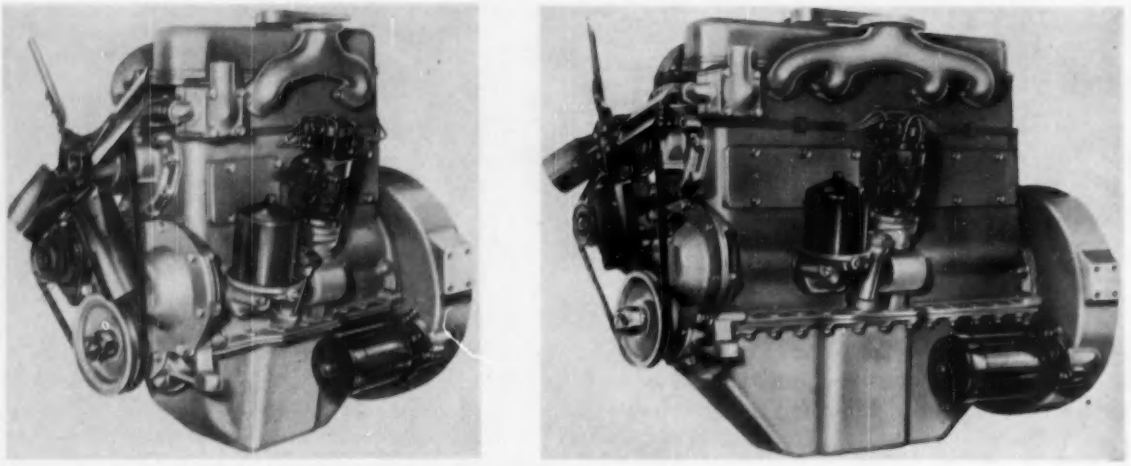
Output of the gas turbine varies considerably with altitude and ambient temperatures. For example, it is more efficient at lower temperatures and can deliver from 10 to 25% more power in cold weather than in extremely high summer temperatures.

Two traction generator sets are driven by the turbine shaft through reduction gears. They furnish direct current for propulsion only. Tractive effort at continuous rating of the motor for 8500-hp input to the generators is 145,000 lb. Speed at continuous rating is 18 mph.

Air brakes will be schedule 24 RL, single and equipment, including safety control features. Main reservoir capacity is 160,000 cu in. Two, 2-stage motor-driven air compressors, each with three cylinders are provided. They are intercooled and rated 202 cfm, 140 psig, at 900 rpm.

Fuel consumption of the turbine under full load will approximate 370 gph. This means that the energy generated by this locomotive from less than one pint of low grade fuel oil would be sufficient to haul a freight car loaded with 50 tons of freight, one mile on a straight level track.

It takes 500 hp from the auxiliary diesel engine-generator set to crank the gas turbine into action. One main generator is used as a starting motor using power from the auxiliary generator. When the turbine gets up to firing speed diesel fuel oil is fed to the burners. After full speed is reached and all burners are up to temperature, preheated Bunker "C" oil is fed to the burners and diesel fuel is cut out.



Views of the 4- and 6-cyl Hercules DD Series engines. Little difference would be noted if the gasoline (GO Series) were substituted here. In fact, the only outward change would appear to be the cylinder head, distributor, and manifolding.

Hercules Introduces New Engines

New Hercules engine series feature diesel and gasoline units based on maximum component interchangeability. Production of common block designs and other components for both type engines boosts volume and practically eliminates space and weight differences.

INTERCHANGEABILITY has been stressed throughout Hercules' new line. In both the GO and DD Series, engines of like size not only are interchangeable as units—the diesel for the gasoline and vice versa—but the planned program of interchangeability is further carried out in many common parts and components. This extends over the entire range of (12) models.

Cylinder blocks not only are interchangeable between the gasoline and diesel engines of like size, but were so designed that they can be turned end-for-end and the flywheel housing and gear cover bolted to either end, permitting the shifting of manifolds and accessories to either right or left-hand side. The flexibility of positioning accessories and manifolds is extremely important where the engine must be integrated with the piece of equipment it is to drive and where engine compartments are limited.

Because of the extensive use of common components, the only difference between gasoline and diesel engines are as follows:

a. Pistons

b. Cylinder head castings (valves and guides remain the same)

c. Spark plugs and distributor for fuel injection nozzles and fuel injection pump

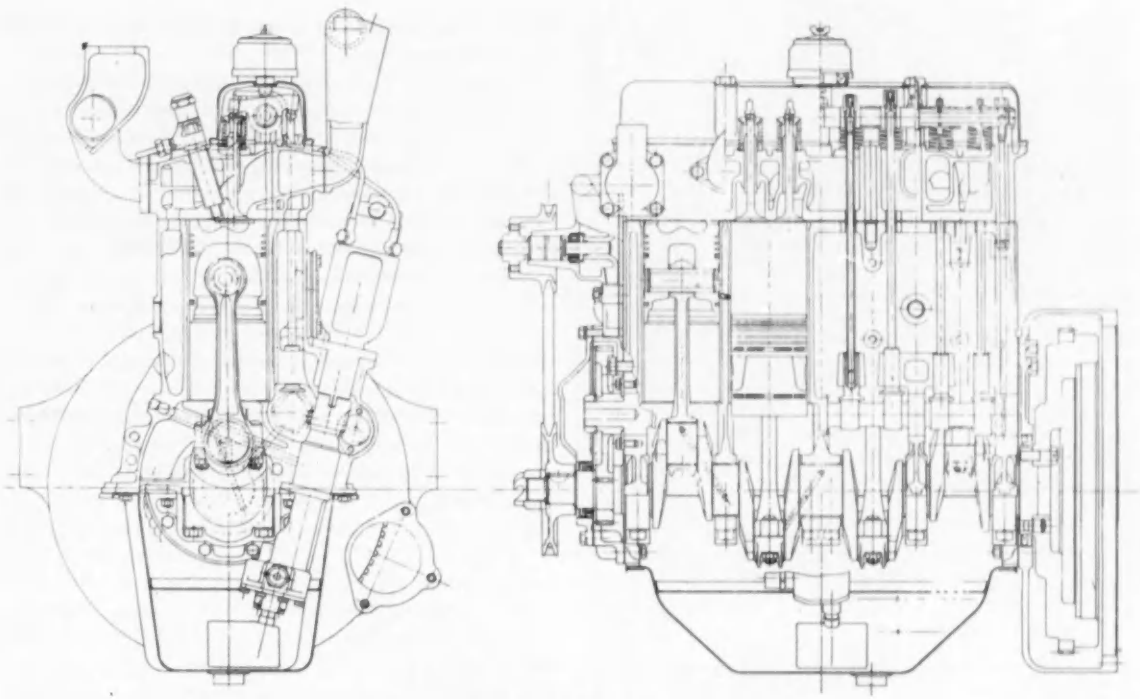
d. Governor arrangement. (The governor is built into the camshaft gear for the gasoline engine, whereas a mechanical governor, built integral with the fuel injection pump, is used on the diesel).

e. Manifold and carburetor on the gasoline engine for the air intake and exhaust manifold on the diesel engine.

In the design of the new series, the direct injection, open combustion chamber principle of converting fuel to energy was selected for the diesel engine along with overhead valve arrangement. In the gasoline engine, the same overhead valve arrangement was adopted to match the diesel design.

Engine design is based on the use of same cylinder blocks, crankshafts, connecting rods, oil pans and front and rear ends of the engines of like size. The same valves, camshafts and valve operating mechanisms are used interchangeably in gasoline and diesel units.

Selection of the open combustion system type permits the building of narrow cylinder blocks and the use of flat deck cylinder heads. Fuel injection nozzles of the orifice



"Mexican Hat" type combustion space, in piston crown and it alignment with the axis of the fuel injection nozzles can be cleary seen in the drawing above. Injection pump and distributor are driven by the same arrangement shown here with no change in driving components.

type are positioned in the cylinder head slightly off the centerline of the cylinder bore in the diesel, and in the gasoline engine the spark plugs take the same position.

Compression ratios are varied by the simple expedient of changing pistons. In the diesel a "Mexican Hat" type of combustion space is arranged in the crown of the piston, properly lined up with the axis of the fuel injection nozzles.

The direct injection combustion system is designed to secure the lowest specific consumption figures that can be expected from diesel engines in this range operating at speeds of from 1000 to 2000 rpm. The open combustion arrangement has the added advantage that low cranking speed is required to start the engine at extremely low temperatures. This, in turn, permits the use of less costly starting equipment. In the design of the air inlet port and the fuel injection system, special consideration was given to make the engines as flexible as possible.

The "DD" series are permitted to operate with maximum full-load speeds up to 2000 rpm. For application requiring diesels of higher speeds, Hercules has available its high-speed turbulence chamber type diesels designed for high speed applications.

A unique and practical arrangement common to the two different types is use of the same mounting for the distributor in the case of gasoline engine and the single-plunger fuel injection pump on the diesel. Thus, the distributor and fuel injection pumps are to be found in identical positions on the two types of engines.

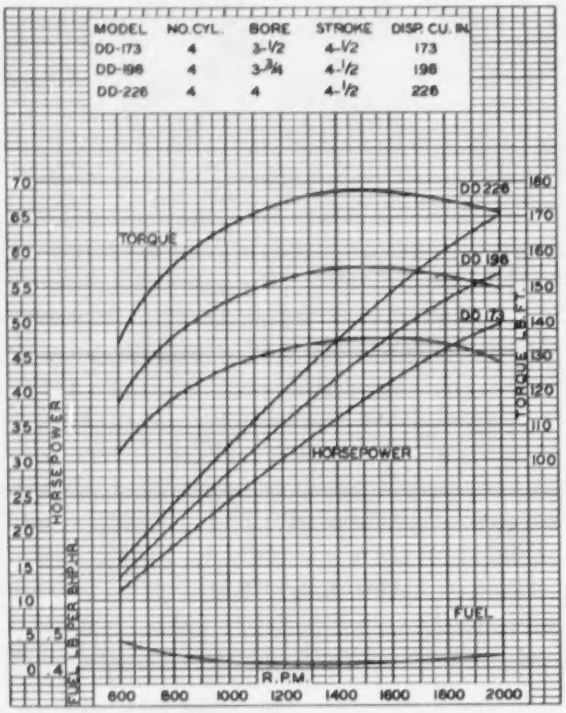
Since more torque is required to drive a fuel pump than a distributor, the helical gear at the center of the camshaft had to be designed strong enough to handle the heavier torque load of the diesel injection pump. It was necessary to provide ample bearing surface and stiff supporting shafts to keep cyclic variations out of the fuel pump and distributor drive to maintain proper timing.

Engine Details

The crankshaft is of ample proportions and has main bearings on each side of every crankpin. The 4-cyl model has five main bearings, and the 6-cyl unit has seven main bearings. All crankshaft bearings both for the main journals, and crankpins, are the precision type. As in all other Hercules engines, crankshaft bearing surfaces are induction hardened.

Connecting rods of conventional design are drop-forgings, fitted with full-floating piston pins. Pistons with liberal length-to-diameter ratio are designed for heavy-duty operation. The gasoline engine has two compression and two lube oil control rings whereas the diesel has three compression and two lube oil control rings.

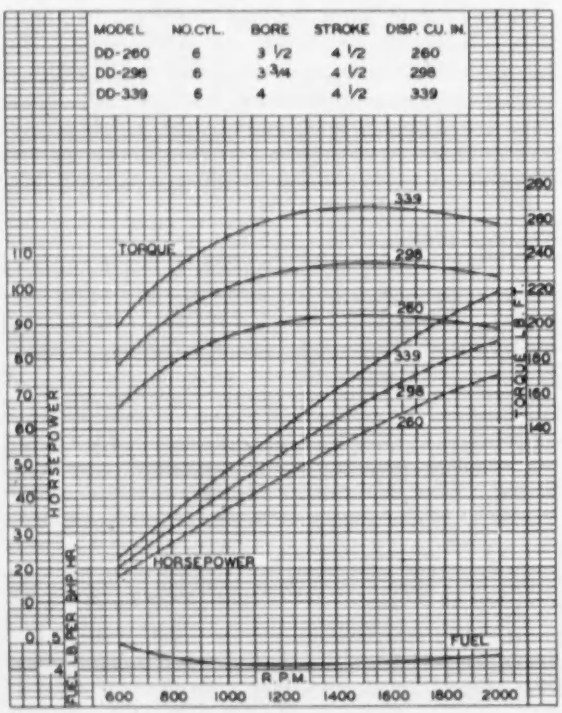
All pistons are aluminum alloy and "anotinned" to provide good run-in qualities. Cylinder blocks are designed fully symmetrical to make both ends identical and take



Performance curves for 4-cyl DD engines.

Arrangement of camshaft and lube oil pump. Note that lube oil pump driven gear is used as the drive coupling for either the fuel injection pump or the distributor.

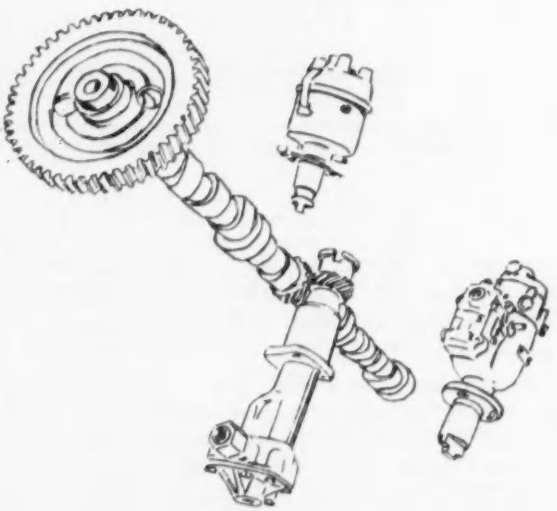
Performance curves for 6-cyl DD engines.



into account the latest foundry practices to insure uniformly good castings.

Precision-type dry liners or cylinder sleeves can be supplied for the 3½-in and 3¾-in bore engines and can be inserted with a "push" fit, making for easy replacement in the field, without regrinding or honing after they are installed in the cylinder blocks. The 4-in bore engines are furnished without sleeves. The cylinder blocks are cast from a suitable alloy iron to insure excellent wearing qualities. In addition engines in the 3½-in and 3¾-in bore sizes are available without sleeves at the customer's option.

Basic oil pans are made symmetrical around the vertical centerline of the engine so that they can be mounted two ways, thus offering two application possibilities. Cylinder heads of the 3-, 4-, and 6-cyl engines are cast in one piece and are available with thermostat housing and water outlet at either end.



As previously noted, valves and ports as large as possible were chosen so the same valves, springs, rocker arms, push rods and tappets not only can be used on engines with different number of cylinders but also interchangeably in the gasoline and diesel models.

A spring-loaded, cluster type of seal at the flywheel end of the crankshaft permits building the engines shorter than competitive engines with the same cylinder bores. Flywheel housings are bolted exclusively to the cylinder blocks and housings of different SAE sizes as well as special housings with a variety of mounting provisions are available to make the engines more versatile. Flywheels can be machined to conform to different requirements.

The combustion system of the "DD" engine was worked out to secure easy starting in cold weather, making it possible to use small starting motors. It is possible, there-

fore, in many applications to use the same starting motor for some sizes of the gasoline and diesel engines.

The water pump for the basic engine is mounted on the front end of the cylinder block. It is combined with the fan and driven by belt from the crankshaft. The design of the pump was worked out in such a way that it can be mounted at either end of the cylinder block and bodies of pumps for different nominal fan and pump heights can be produced from combination pattern equipment and by using common tools and fixtures. The symmetrical design of the water pump inlet opening on the pump body allows the inlet pipe to be installed pointing to either side regardless of which end of the block is used for mounting the pump.

The timing gear housing with cover is bolted to the end of the cylinder block in the same manner as the flywheel housing. The basic engines have two timing gears, one on the crankshaft and the other on the camshaft. The gears are wide and cut with helical teeth to insure quiet, long-life operation.

Use of a separate casting to house the timing gear of the engine enables Hercules to offer the engines with a multitude of different front mountings at competitive low cost and, at the same time, permits the economical building of the engine with a wide variety of different gear arrangements. Engines are available with special front ends which incorporate positive drives for accessories, such as, hydraulic pumps and other items where gear drive is desired to shorten the length or width of the engines and to eliminate belt arrangements.

The design of the basic diesel version of the new series of engines calls for a distributor-type gear-driven, single-plunger fuel injection pump, but where it is desirable to use a multiple plunger fuel injection pump, provision is made for this type also. Familiarity with servicing the multiple plunger pump in certain overseas areas prompts such provision.

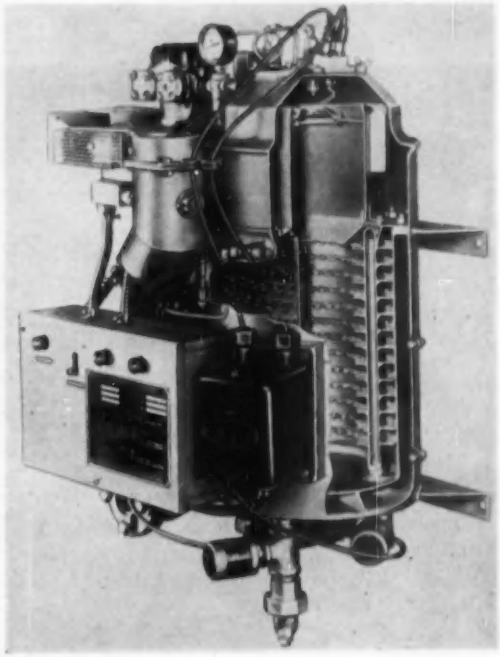
Summary

This development by Hercules is another important advance in the realm of making diesels more competitive with gasoline engines in the same applications. Cost, together with size and weight considerations, have tended to prejudice the diesel in certain applications despite the diesel's inherent economy of operation, excellent torque characteristics and reliability.

By boosting the volume of component production through design for maximum interchangeability between gasoline and diesel models, unit costs can be reduced. A factor in this is the use of common tools and fixtures. Use of the less costly distributor-type injection pump and the common drive arrangement also helps.

With this interchangeability feature, weight and size differences are practically non-existant. Flexibility of accessory arangement is an added attraction in tailoring an installation.

These all add up to giving the customer a better chance to capitalize on the potential economies of diesel operation.



VAPOR HOT WATER HEATERS

OIL-FIRED hot water heaters are now used to supplement electric immersion heaters heating some of the new lightweight railway cars. The use of electric and oil-fuel heaters in a liquid heating system is a new development in train heating.

These automatic hot water heaters were originally developed to keep the diesel locomotive engines warm during non-operating hours. This saved fuel and engine wear resulting from long hours of idling.

Today, engineers of the Vapor Heating Corp. have adapted these booster heaters so that they supply additional heat to keep the cars comfortably warm on cold winter days.

Both of the new Aerotrains have these booster heaters installed in one of the side compartments under each of the ten passenger cars. They have an output of 125,000 to 150,000 btu per hr and yet are small enough to fit into small compartments.

A forced-draft fire burns in an Inconel fire-pot. Hot gases from the fire transfer heat to the water as it is pumped through two water jackets. Steel rings with jagged teeth are welded to the water jackets in order to give more heating area and transfer the heat more effectively in a limited space.

An electric spark lights off the fuel oil and thermostatic controls make the heaters turn on and off as needed. A fuel pump, forced draft motor and all the automatic controls are made into the small package shown in the illustration.

Talking Shops

. . . brings you the results of an interview at Niagara Frontier Transit—their actual costs on rebuilding Mack END 672 diesels. How does your operation stack up with this one?

NIAGARA Frontier Transit System operates a fleet of 690 buses in and around Buffalo, New York. NFT has an award-winning maintenance record. The reasons for this will become obvious as you read on and discover some of the thinking behind the operation.

Going through the shop, we followed the same route that an engine in for rebuilding takes. While talking to Bill Kunz, Superintendent of Maintenance for NFT, we discovered that he had just finished preparing a talk which was to be presented before a meeting of the American Transit Association.

The talk was the culmination of many months of study concerning the costs and man-hours involved in the overhaul of Mack Model END 672 diesels at NFT. In effect, the talk said ". . . This is what we are doing at NFT. We don't claim to be experts. We hope that some of the information will be of some value to you and we welcome any suggestions which you think will improve our operation within the practical and economical limits which we all must operate under . . ."

In other words, NFT has an open mind when it comes to improving their already well-planned maintenance and rebuilding operation.

Suppose we let Bill Kunz take it from here and give us a rundown on this study he has made:

"To do this thing right, we will have to go into sufficient detail so that anyone can compare their operation to ours. For this reason, I will stick to the engine proper and not go into any detail on the accessories.

"The type of service which these engines are in varies considerably, and consequently the mileage between major overhauls varies. In order to give some idea of the average mileage delivered, perhaps the best way of putting it is as follows. We have 300 buses equipped with Mack END 672 engines. Mileage operated since purchase averages well over 250,000 mi per bus. We have not as yet found it necessary to overhaul all these engines, the last one being removed at 259,000 mi in June of this year.

"We remove our engines for overhaul on the basis of oil consumption and miles operated. In other words, after engine oil consumption has reached the point where we get less than 60 miles per quart for added oil and rings have been replaced twice before and the engine has operated over 100,000 miles, we overhaul the engine rather than try another re-ring job.

"If on the other hand the engine has operated under 100,000 miles and has been re-ringed but once before and the cylinder wear at the time of re-ringing indicated no abnormal wear, we will simply re-ring that engine.

"We take 60 mi per qt of make-up oil as the condemning point because at that point we find that we are beginning to get too much smoke out of the exhaust for good public relations. We check our exhaust smoke by a visual inspection on the part of the garage foreman. He is checked from time to time by the use of a smoke meter to make sure that over a period, his performance judgment does not become influenced in such a way that he is automatically lowering his standards each time a bus is checked.

"This operation is not performed on every bus, but only when there is some question as to the judgment of the foreman.

"For example, complaints of smoking were made about a particular bus. Records showed that oil consumption was within normal standards. Although the foreman agreed with the complaint, a test was made to verify the condition. The time required to make this test is 0.5 hr or $1.30.

"When any check up shows that the engine requires an overhaul, the bus is brought to our central repair shop and the engine and transmission are pulled as a unit. We do this work with a Ruger Hoist and the total time required to remove the unit is 6.3 hours or $16.55, broken down as follows:

First, engine compartment panels and braces are removed to allow removal of engine and transmission as a unit. This whole operation takes 3 hr or $7.90.

Next, all air, water, fuel and drive lines are disconnected from the power plant unit. This takes 2.3 hr or $7.35.

The unit is then removed and set into the carrier rack in which it is transported about the shop as long as it is in an assembled state. This operation requires 0.5 hr or $1.30.

"After the engine has been removed, it is steam cleaned completely, requiring 1.5 hr plus 30c for cleaning material or a total cost of $3.85.

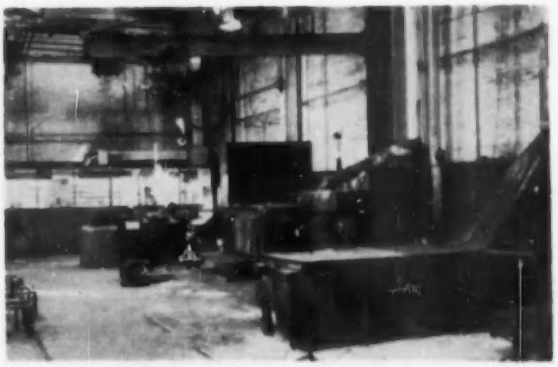
"From the steam cleaner the engine and converter-assembly goes to the stripping station, where the transmission, generator, starter and other accessories are disconnected and sent through their own repair cycles.

"The engine is then stripped, piece by piece and all the parts are assembled in baskets, and cleaned. After cleaning, parts are placed in a rack. Each part has it's own particular place and every rack contains all of the parts necessary for a complete engine reassembly. This rack is then towed by an electric truck to the engine rebuilding shop.

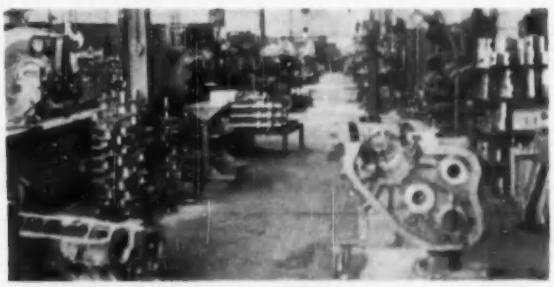
"The men doing this stripping are what we call "C" Mechanics and do not have any responsibility as to determining what parts are to be reclaimed. Total time required to strip and clean every portion of the engine block and valve gear, place all parts in the rack and deliver it to the engine builder is 9 hr plus $1.80 for cleaning materials, a total cost of $24.40.

"The engine rebuilder has the responsibility of sorting the parts he uses in rebuilding his engine into those for reclaiming, those to be scrapped and those which are to be used without other work being done on them. He likewise arranges for the replacement of all scrapped parts. This consumes 2.2 hr or $5.80.

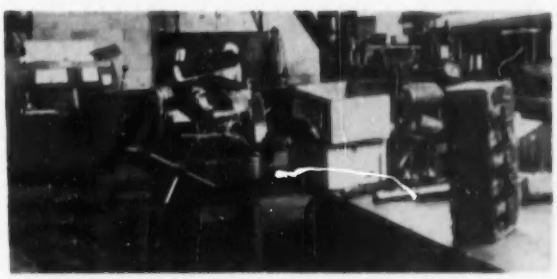
"Inspecting and testing the block consumes 2.5 hr or $6.45. Reboring requires 8.5 hr or $21.95, but the engine we are following through the shop had to be re-sleeved, which required 1.5 hr plus $89.20 for a set of sleeves, a total cost of $93.05. After being re-sleeved this block was honed, requiring 2.5 hr or $6.45.



After removal from the buses, engines are cleaned externally and then brought into this section of the shop where engines are torn down and parts cleaned.

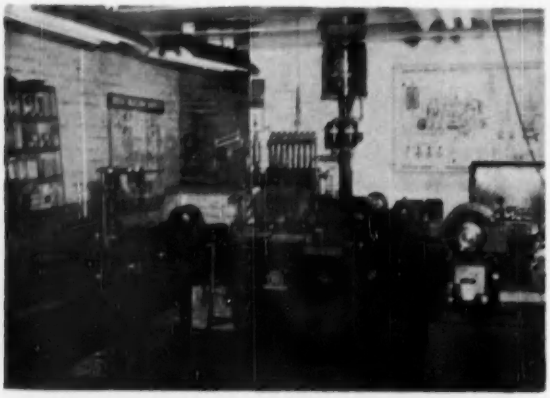


The next stop is the engine rebuilding section. The portion shown above is set aside for regrinding crankshafts and engine assembly.

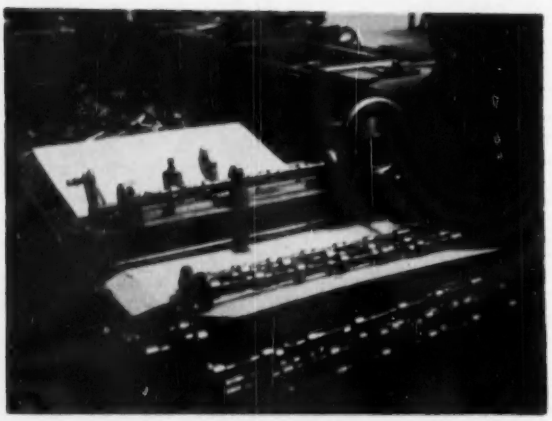


Another section of the engine rebuilding area houses the cylinder head department. Valve gear is also reworked at this location.

Lapped surfaces are refinished on the rotary lapping plate shown below. The hone also comes in handy for precision fitting of parts.



In one corner of the shop a glassed-in enclosure serves as the injection department. A blower supplies filtered air to the room, keeping the pressure in the room slightly higher than the surrounding shop. This helps to keep dust particles out.



The jig shown here is used to adapt a crankshaft grinding machine to camshaft grinding. This jig was developed and fabricated at NFT's shop.

Below, is another portion of the engine rebuilding area. Piston assemblies are reworked in background. Engine rebuilding stands are at left.

"Thus, cost of reconditioning this block was 6.5 hr plus $89.20 for a set of sleeves, or a total cost of $105.95. This is higher than average because 50% of the time we are able to re-bore instead of re-sleeve. An average job costs us 11.4 hr plus $45.40 for lifter bushings and sleeves, a total cost of $74.85.

"We then move on to head reconditioning. Resurfacing work was not necessary on our sample engine. (It takes 1 hr to do a pair of heads, or $2.60.)

"Installing valve inserts likewise, was not necessary on our sample engine. It takes 2.2 hr to do an insert job without grinding, plus $18.90 for a set of inserts, a total of $24.60.

"The valve guides are then checked and replaced, valves are ground, rocker arm bushings renewed and the head tested. The time required on the sample engine for this work, including valve grinding, was 9.2 hr plus $5.05 for a valve guide and rocker arm bushings, a total of $28.50. This is lower than our average because normally we do have to surface grind the heads and provide some valves, guides and springs. An average reconditioning job costs us 11.5 hr plus $35.20 for valves, inserts and guides, a total cost of $59.95.

"Our sample engine did not need any work on valves except regrinding. The average cost of reclaiming a valve is 0.5 hr plus 30c for welding materials, a total of $1.60.

"The camshaft was checked and only one lobe had to be reground. The time required for this operation was 1.8 hr and the cost was $4.75. Again this was less than average. Normally we find it necessary to refinish two lobes, one of which usually requires some building up at a cost of 3.5 hr plus 55c for a welding rod. Total cost for average camshaft reconditioning is $9.70.

"Where necessary crankshafts are reground after straightening and dye checking. Total time required for this operation on the sample engine was 8 hr for a total cost of $20.90. This is slightly lower than average cost because the sample shaft did not have any burrs on the centers requiring recentering. The time for reconditioning an average shaft is 8.5 hr for a cost of $22.55.

"Line-boring the crankcase, equipped with all new main bearings and new camshaft bearings, on the sample engine repaired 5.8 hr and the material cost was $36.90 for a set of main bearings and 3 camshaft bearings. Thus, the total cost of this phase of reconditioning of the sample engine was $52.35. This is somewhat lower than an average engine because normally we require all new bearings at a cost of 7.5 hr and $44.40 for a complete set of main and camshaft bearings, a total cost of $64.35.

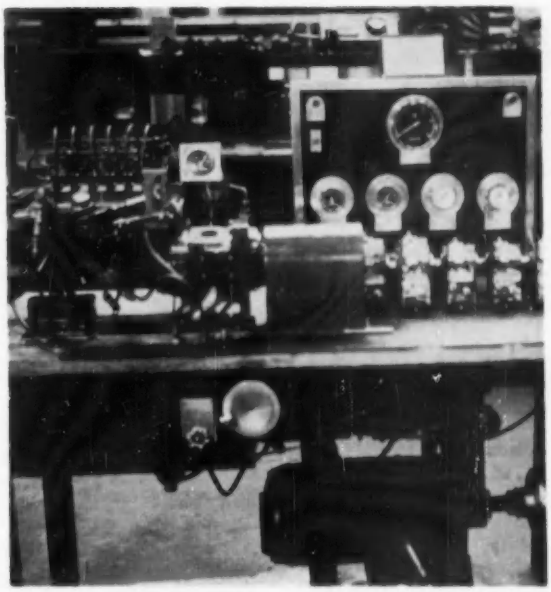
"The next operation is the reconditioning of connecting rods. This whole operation on the sample engine required the expenditure of 3.1 hr broken down as follows:

Connecting rods straightened, rebored and new bearings being fitted to a reground crankshaft. This part of the operation consumed 1.5 hr.

(Turn Page For Continuation)

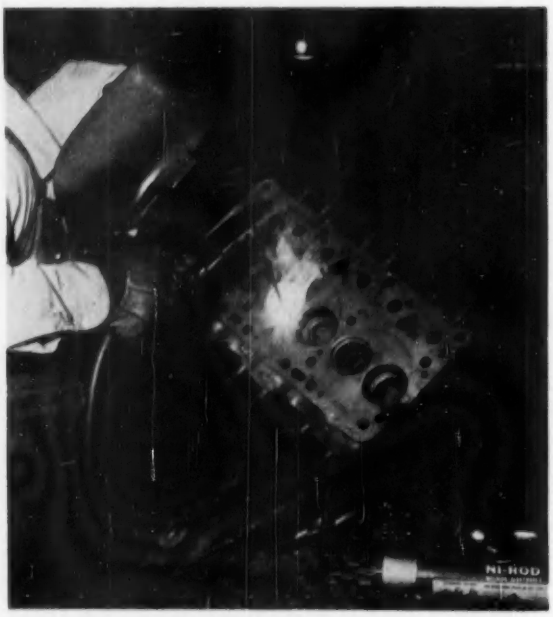
Summary Analysis Of Engine Overhaul Cost

No.	OPERATION Description	SAMPLE ENGINE Labor Hours	Material	Total	AVERAGE ENGINE Labor Hours	Material	Total
1	Smoke meter test.	.5	$	$ 1.30	.....	$	$ .....
2	Spotting bus, removing body panels and bracing.	3.0	.....	7.90	3.0	.....	7.90
3	Disconnect power plant, air, fuel water and drivelines.	2.8	.....	7.35	2.8	.....	7.35
4	Remove power plant and mount on carrier rack.	.5	.....	1.30	.5	.....	1.30
5	Spotting power plant in cleaning room and cleaning.	1.5	.30	3.85	1.5	.30	3.85
6	Strip engine, clean all parts and assemble them on carrier rack.	9.0	1.80	24.40	9.0	1.80	24.40
7	Spot rack 'n engine shop and sort material in usable, reclaimable and not usable condition.	2.2	.....	5.80	2.2	.....	5.80
8	Cleaning and testing block for leaks.	2.5	.....	6.45	2.5	.....	6.45
9	Reboring block.	.....	.....	.....	4.3	.....	11.15
10	Resleeving block.	1.5	89.20	93.05	.8	45.40	47.45
11	Rehoning block.	2.5	.....	6.45	3.8	.....	9.80
12	Resurfacing heads	.....	.....	.....	1.0	.....	2.60
13	Installing valve inserts.	.....	.....	.....	.8	6.30	8.35
14	Grinding valve seats, assembling and testing heads.	9.2	5.05	28.50	9.7	35.20	50.95
15	Regrinding camshaft.	1.8	.....	4.75	3.5	.55	9.70
16	Clean and dye check crankshaft.	1.7	.10	4.45	1.7	.10	4.45
17	Machine and straighten crankshaft.	1.5	.....	3.90	2.0	.....	5.25
18	Regrind crankshaft.	4.8	.....	12.55	4.8	.....	12.55
19	Linebore crank and cam shaft bearings.	5.8	36.90	52.35	7.5	44.40	64.35
20	Check rod alignment.	.7	.....	1.85	.7	.....	1.85
21	Rebush and fit pins.	1.0	13.95	16.55	1.0	13.95	16.55
22	Fit rod bearings.	.8	16.50	18.55	.8	16.50	18.55
23	Assemble pistons on rods.	.6	.....	1.60	.6	.....	1.60
24	Clean and resize pistons.	.7	.....	1.75	.4	65.90	66.90
25	Regroove pistons.	.4	36.20	37.25	.2	37.35	37.90
26	Cleaning and resurfacing sealing surfaces.	5.0	.....	13.35	5.0	.....	13.35
27	Assembling engine.	8.5	13.70	35.70	8.5	27.20	49.20
28	Running in and testing.	3.0	2.45	10.35	3.0	2.45	10.35
29	Reinstalling in bus, testing all lines and drives.	14.0	.....	36.90	14.0	.....	36.90
	Totals	85.5	$216.15	$437.20	95.6	$297.40	$544.80



Governors are tested at this bench. Here again we see another set-up which was put together by the men in NFT's main shop. Gaugeboard is similar to many others in the shop for various testing jobs and like the others, was built here.

Engine dynamometers too, were fabricated by NFT personnel. Two engines (another behind the one shown) are in position when an engine is to be run-in. One engine is used to "load" the other.



NFT has been saving $5000 a year welding cracked engine blocks and rebuilding valve seats. Cost of each valve seat repair job runs about $41 where a new head costs an average of $144.

After welder has built up seat of preheated head, head is allowed to cool slowly in oven and is then machined to close tolerances.

Piston pin bushing installed and fitted to pins. This required 1 hr.

"After this, pistons are assembled on rods and made ready for installation in the engine. This consumes 0.6 hr. Thus the total cost of reconditioning the set of rods on the sample engine was 3.1 hr plus $30.45 for complete sets of rod bearings, bushings and pins, a total of $39.55.

"The next operation was that of reconditioning the pistons. In the case of our sample engine, because we relined the block, we were able to re-size the old pistons. This consumed 0.7 hr. After re-sizing, the pistons were re-grooved, an additional 0.4 hr. Thus the total cost of reconditioning the pistons of the sample engine was 1.1 hr plus $36.20 for a set of rings or $39.00. This is considerably less than our average job because normally about 50% of our engine overhauls require new pistons and spacers. An average piston reconditioning job costs us 0.6 hr labor plus $103.25 for pistons, rings and spacers or $106.40.

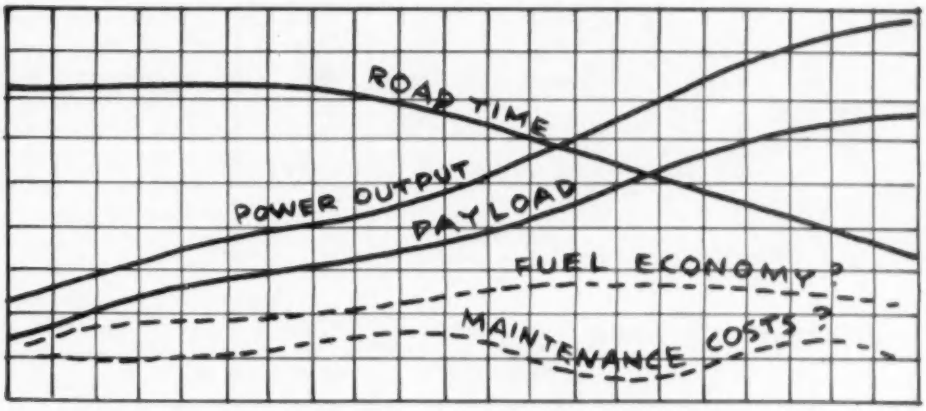
"Now, of course, the various engine parts such as manifolds, oil filter, oil pan, valve covers, bell housing, etc., must be checked for tightness and sealing surface. Resurfacing a manifold sealing surface takes only 0.2 hr. The total time to do all this type of work on the sample engine was 5 hr, which cost $12.35. This cost is about the same as our average cost for these operations.

"All the component parts of the engine have now been reconditioned, the material for one complete engine is all in the assembly rack and the engine builder assembles his engine. Installing pistons required 8.5 hr plus $13.70 for a set of gaskets, a total cost of $35.70. This is slightly less than the average. Normally we have to replace some valve lifters and the starter mounting at a total cost for the entire operation of 8.5 hr plus $27.20 for lifters, gaskets and mounting, or a total of $49.20.

"The final step is installing and testing in the 'running in' stand. During this operation all fittings and appurtenances are tested for tightness under load. The engine is run in so that it can be put into full load service with no reservations whatsoever. This entire operation requires 3 hr, plus $2.45 for lube and fuel, a total of $10.35.

"This gives us our sample engine completely overhauled and we now put it back into the bus, re-install all the bus engine compartment panels and braces, test all connections and otherwise ready the bus for service insofar as the power plant is concerned. This required 14 hr at a cost of $36.90.

"The accompanying tabulation gives a Summary Analysis of overhaul costs. You can see that the total cost of overhauling our sample engine, starting with a smoke test and ending with it reinstalled in a bus was 85.5 man-hr plus material worth $216.15, for a total cost including all overhead of $437.20. For the reasons stated, this particular engine overhaul cost somewhat less than our average for engines of this type which runs at 95.6 hr plus material at $297.40 for a total cost of $544.80."



"Hot-Rodding" Heavy Duty Engines

Sure, you can increase engine horsepower in several ways. And you can use the power to do a job faster or to do more work. But what happens to fuel consumption and maintenance costs. Here are some thoughts on the subject.

By Don Smith

"IF I could only get just a little more power out of this engine". This is the often-expressed desire of many owners whose engines are not up to carrying new loads which have inched up on them. It is also the cry of those owners of equipment, the engines of which are just on the edge with no reserve power and are always lugging even under normal full-load operation. And of those owners whose engine condition is such that even the rated output cannot be developed any longer.

Regardless of the reason, if you need more power there are two ways of doing it. You either buy a new higher output engine to fit the available space or you increase the horsepower of your present engine. Naturally the tendency is to uprate the older engine since it's cheaper than buying a new one.

However, the decision is not quite that simple. If uprating your engine means higher maintenance and repair costs, the initial saving may be offset. If such is the case you're better off buying a new engine. It's cheaper in the long run.

There are several ways by which an older engine's output can be increased. But no matter which method is chosen, the engine condition should be appraised carefully. You must determine if its parts can stand the additional power provided. Very often the parts can take the added stresses. One common way to increase power is to go to over-size bores. This is a valid way to get the horsepower needed and is, in fact, one method commonly used by the engine builder.

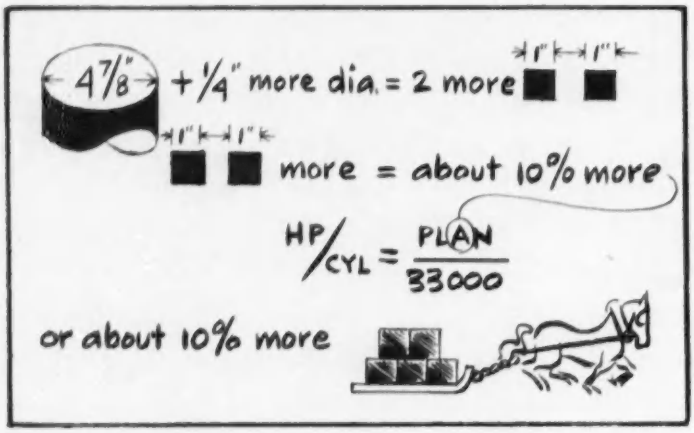
New Engine Design Trend

For years, heavy-duty engine manufacturers have been designing engines with lower weight per horsepower rating. A substantial share of this uprating has come from increasing cylinder bore sizes and piston compression ratios (the latter mainly for gasoline engines). In many cases the same basic engine block is used.

However, higher output for a given engine size and weight also means higher bearing pressures and greater lubrication and cooling problems. At some period in this uprating, therefore, increasing maintenance costs due to these more highly-stressed smaller higher-powered engines, offsets the advantages gained.

Practical field experience, regardless of theory, has proven that such a point does exist. Design engineers with all their facilities can carefully calculate this point where increased maintenance costs offsets the greater income gained by the very nature of these compact high-powered units. In past years, what now appear to be excessively large safety margins were incorporated in all engine designs. Cooling systems, valves, blocks, crankshafts and other parts were made heavier and with larger capacities than necessary. This was due to the fact that field operation does not give ideal operating conditions and maintenance practices of laboratories.

The modern trend, however, has narrowed this gap. More and more power has been packed into engines without increasing their size until it appears we are balancing on a borderline. The result is lower safety



margins since the parts are more highly stressed. The problem is of less concern to the operating field than it is to design engineers. The reason is that if the balance point is passed in engine design, the field soon discovers the shortcomings and sales fall off, forcing a design revision. It is then the design engineers' headache to rectify this condition, so that their product will once more become desirable.

Increasing Older Engine Design Output

Independent parts manufacturers have watched with interest this trend of increasing new engine horsepower while maintaining the same engine size. The reason being that they wish to be in a position to supply the engine builders with the necessary parts.

Observant independent parts manufacturers have also followed closely this process of enlarging bores. They are aware that in most cases the safety margins of older engines are such that the engines can stand higher stresses due to greater output. Therefore, they are applying these larger bore sleeves to the engines in the field to uprate them. This has produced another pattern of development now firmly entrenched and demanding public recognition.

This pattern is the modification of older design engines with "conversion kits" to bring the horsepower output up to that of later models. Most of this so called "hot rodding" is done by using sleeves with increased cylinder bore sizes and/or pistons with increased compression ratios (the latter for gasoline engines). Valves, cams, and injectors are sometimes also modified, but mainly conversions are accomplished by piston and sleeve change.

The trend has gained real momentum especially since manufacturer's such as Cummins have come out with new higher horsepower models but made practically no change in the block. For example, Cummins introduced their model NH engine with 5⅛-in cylinder bore, using substantially the same block that had been used in the earlier 4⅞-in bore HB series.

Users of the older HB's soon found ways of installing sleeves with 5⅛-in bores. In answer to the resulting demand for these parts, several manufacturers quickly started to make and furnish their parts. Today almost all HB blocks have been converted to 5⅛-in bores and the conversion is recognized as being both practical and economical.

Caterpillar's introduction of a 4½-in bore engine to succeed the former 4¼-in almost immediately led to a demand for 4½-in sleeves and pistons to fit older models and another conversion was established.

Furthermore, this trend is not confined entirely to the diesel field. IHC gasoline engines fell in the same general pattern. As the field discovered the same basic block being used in 3 9/16-in, 4⅛-in and 4⅜-in bore engines, experimentation soon forced the production of sleeves and pistons whereby the smaller bore engines could be converted to the maximum.

Today the list of parts available for engine conversions has reached virtually all engine makes and models. All fields using work engines have been affected including construction, agriculture and over-the-road hauling.

Manufacturers' production figures clearly show that sales of older small bore parts are rapidly falling off. On the other hand sales of larger bore parts are increasing, indicating that field engines are definitely being uprated by using larger bores, sleeves, etc. More important, certain engine parts manufacturers are offering newer parts with constantly increasing bore and compression ratios. It is safe to estimate that several hundred thousand engines have already been converted. This has placed the seal of public approval on the practice—*up to this point.*

However, you just can't go overboard with this practice. Every application must be considered as an individual case. Some older engines can stand the increased stresses, other engines cannot. Determining the critical balance point where increased power output of older engines brings about excessive maintenance costs is much more difficult than figuring the same balance point in newly designed engines. With cooling and exhaust systems no longer operating at peak efficiency; with cyl-

inder head and block distortion destroying previous exact tolerances, etc., it is not unusual to hear of engine failures being blamed on "conversions".

However, further investigation usually discloses the failure to be the result of a contributing cause not allied with the conversion itself. The apparent confusion frequently results in one fleet praising a certain engine conversion while their neighbors condemn the same thing. But the fact still remains that engine condition must definitely be taken into consideration when deciding if your engine can be safely uprated.

These mechanical problems are further complicated by lack of owner understanding. Most owners simply view extra power as a way of doing more work in a shorter time. And they are probably justified in doing so. But even if your engine is uprated there's still a limit on the load it can take. If an engine output is increased and an additional load is put on so that it lugs, you are worse off than before.

Where this results in a peak power output demand for prolonged periods, maintenance costs can easily skyrocket whereas if the same extra power were used only to ease engine strains, maintenance costs would drop. For example, an engine which constantly operates under an overload condition because it lacks reserve power, will no longer lug if its output is increased to handle the same load. In addition to lower maintenance costs, its life will be lengthened and downtime decreased resulting in a more efficient and dependable engine.

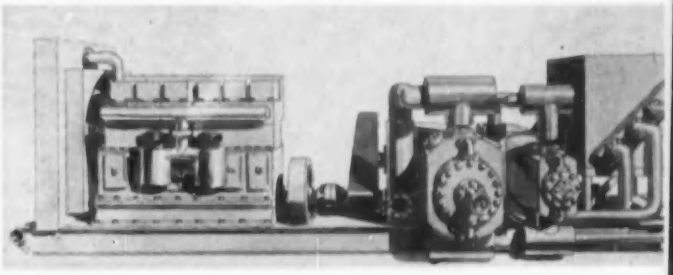
Conclusion

Owners of equipment who understand and recognize this situation have capitalized on it and are enjoying the successful results. Large sales of engine parts prove engine conversions are here to stay. Developments up to now indicate we can expect to see additional new parts being offered with still greater cylinder bore sizes and piston compression ratios.

But field surveys show that lack of practical service information is causing unnecessary loss of labor and materials in unco-ordinated experimentation. It's apparent that it is time for the trend to be recognized and a clearing house established for the purpose of supplying service information.

What the best medium is for the evaluation and exchange of this information must be decided upon and developed as soon as possible. Is this an SAE or some association project, or can some trade publication such as DIESEL POWER be of the greatest service in this new important field?

Regardless of how it is done, the fact remains that those thousands of owners whose engines need just a little more power must be reached and informed that this is not only possible but in most cases practical and economical. The stakes are high enough to warrant a thorough discussion of the pros and cons of each case before making a decision. So get the facts before you jump.



C-B COMPRESSORS FOR A VARIETY OF GAS WELL SERVICES

AUXILIARY pumping devices are essential in assuring the greatest return from gas wells as they become depleted. The demand for a compact yet rugged compressor has been increasing steadily for the past several years.

Mr. S. E. Johnson, of Cooper-Bessemer Corp. has announced that their answer to this demand is the development of a compact, efficient reciprocating compressor for diesel or gas engine drive.

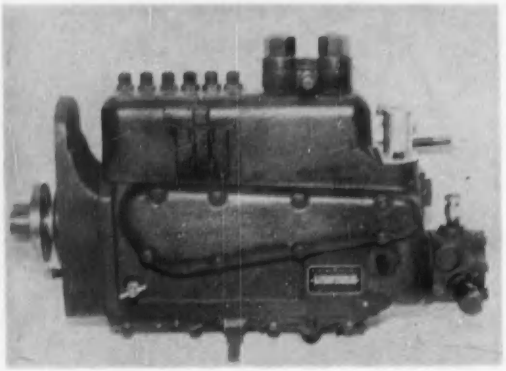
This latest compressor, known as the FMP, ranges from 100 to 300 hp. It was designed for use in field-gathering systems, gas-lift operations, repressuring and booster service installations.

Special attention has been given to peak operating dependability under severest conditions. This basic requirement is important since compressor units of this type must operate in remote locations with little or no attention.

Basic engineering developments already perfected and used in Cooper-Bessemer's type GMXD, vee-angle compressors have been incorporated in this newest unit. It is ruggedly built and operated at a relatively slow speed.

Cylinders of the compressor can be mounted singly for single-stage compression, in tandem or as twin units for two or more stages, adapting the unit to a wide range of services.

Since mobility in the field is one of the most desirable features for this type unit it has been designed to be skid mounted and operate as a portable unit. But the compressor can be mounted on a conventional concrete base if necessary. Also the compressor can be belt-driven from an electric motor as well as engine-driven.



I-H's New Model "B" Fuel Injection Pump

Improved versions of International Harvester's single-and double-plunger pumps feature simplification and longer part life.

ALL new production engines from International Harvester's plant will be equipped with their Model "B" fuel injection pump. They have gone ahead and modified the earlier design to simplify it and to improve the wearing qualities of some of the parts. Fundamentally, the design has not been changed and so after a brief review of the earlier system it will be possible to concentrate on the modifications.

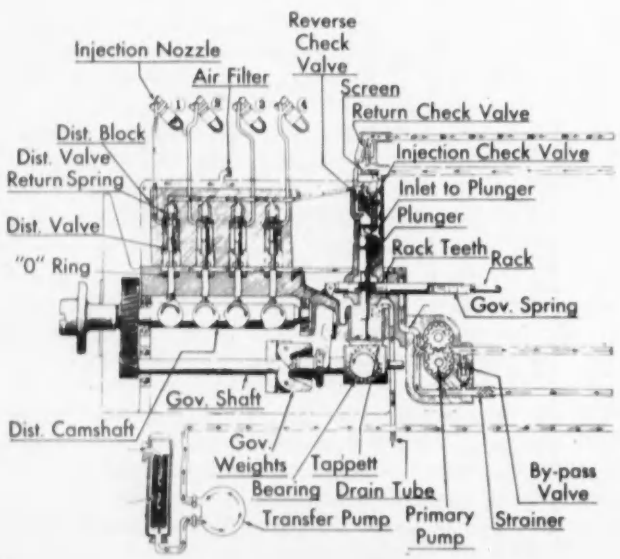
Both old and new systems are of the distributor type. On 4-cyl engines, a single plunger unit serves all cylinders; 6-cyl engines use two plungers, each serving three cylinders. Cam-operated valves in a distributor block connect the pump discharge to the appropriate cylinder in firing order sequence.

Metering and delivery of fuel are controlled by the plunger unit (or units). The familiar port-and-metering helix principle is used to alter the pump's effective delivery stroke. A rack and pinion turn the plunger to alter the port and helix relationship.

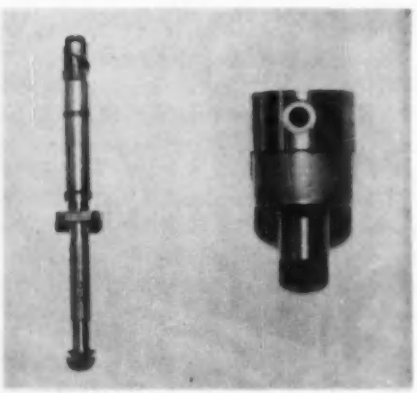
The fuel's path can be followed by reference to the schematic drawing shown. Fuel leaving the primary pump goes through a filter, than to a reservoir above the plunger. It has to go through a strainer to enter the two ports in the plunger bushing. Here the metering and high-pressure pumping takes place.

Discharged oil lifts a check valve and enters the distributor block above the heads of the valves, tending to hold them on their seats. One valve will have been opened by its cam to permit flow to the appropriate nozzle. All of these functions are properly timed by the interrelationship of the camshaft and the governor shaft that also drives the pump cam.

So far this is pretty straight-forward and needs no further elaboration. However, there are a few features peculiar to the I-H pumps that will bear further comment. For example, line pressure is reduced when injection ceases by a reverse check valve. The delivery check valve will seat as soon as pressure beneath it is relieved as the



Schematic diagram of new Model "B" fuel injection pump showing the components and the flow of fuel.



Harder material in the pump plunger and bushing have greatly increased their average service life.

plunger helix uncovers the bypass port. The reverse check valve now opens to relieve the line pressure and eliminates possibility of nozzle dribble.

Another feature is the return check valve. You can imagine that when the helix uncovers the bypass port there is a pressure surge back into the fuel reservoir above the plunger. This raises hob with trying to keep an even pressure on the bushing inlet ports. The return check valve, sensitive to reservoir pressure, opens to spill fuel when pressures rise and thus keeps the reservoir pressure constant.

Now we come to the scavenging system. Its function is to return any bypassed or leakage fuel to the tank and to help ventilate the pump. Well, it "ain't no more". Elimination of this system is the major step in the simplification of the new Model "B" pumps.

Both the scavenging valve and pump are eliminated. Leakage oil that lubricates the distributor valves is returned to the fuel system through the suction side of the primary pump. Oil flowing through the return check valve and fuel return pipe now runs to the air trap on power units or the fuel tank on tractors.

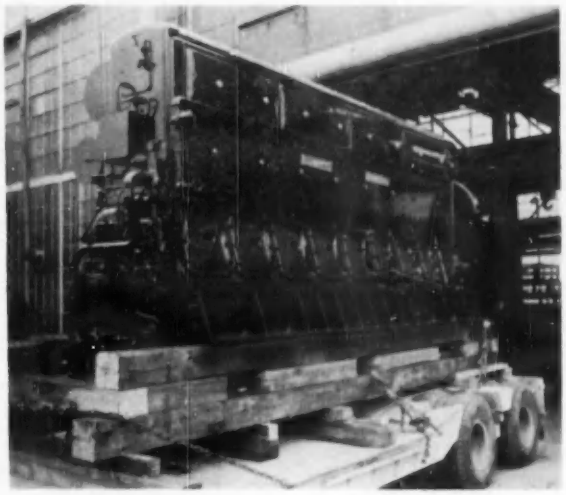
Lubrication of the plunger assembly is by fuel leakage. Any excess is now drained to the atmosphere by a separate pipe. The former injection pump air cleaner and its components are replaced by a breather in the housing cover. In this way, all of the functions of the former scavenging arrangements are handled, but differently, in the new model. This eliminates the scavenging pump, scavenging valve, a strainer, and simplifies the ventilation system.

In getting rid of the scavenging pump, one set of gears in the primary pump are eliminated. So is the scavenging valve. This valve was necessary to seal off the return line from the pump when the engine was stopped. Otherwise, it was possible for fuel from the tank to flow back and fill the scavenging and ventilation passages in the pump. It was held closed by spring pressure and opened by fuel oil pressure from the primary pump when the engine was started.

Change in the plunger and bushing assembly has been aimed at increasing its service life. A new and harder material has been used and I-H says that they are getting up to four times the life of the earlier types.

Another change is found in the distributor block. There is some leakage of fuel permitted around the valve stems to provide lubrication. But if any excess gets past the valve tappets it gets into the lube oil in the base of the pump and results in undesirable dilution of the lube oil. To prevent this, "O" rings have been put around the distributor valve tappets.

These are the principal changes that were made when the pump was modified. Simplification and greater service life plus a more positive means of protecting against fuel dilution of the lube oil have been achieved. It will be good news to owners of engines with the older model pumps that the new plungers and bushings are interchangeable with the earlier models.



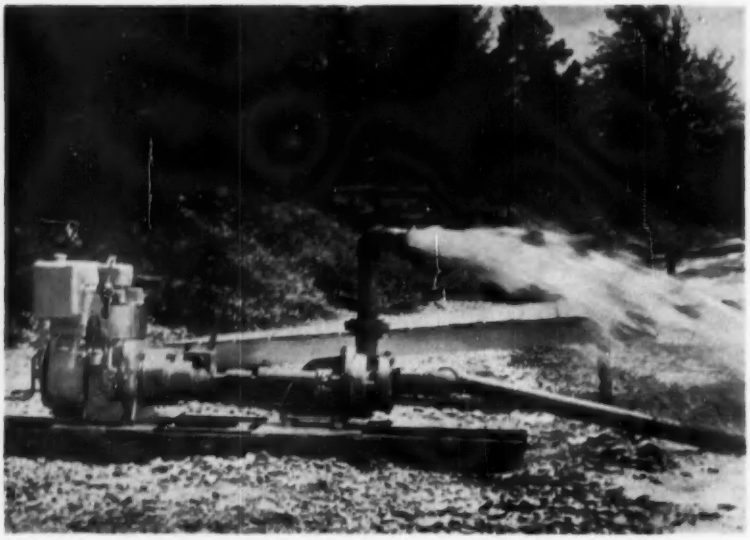
WHITE SHIPS FIRST OF IMPROVED AND UPRATED SUPERIOR ENGINES

IN line with the development and improvement program for their Superior engines, White Motor Co. has built and sold its first 2000-hp engine. This program was initiated when White took over the Springfield, Ohio plant on April 1st, 1955. Since that time the existing line of heavy duty Superior and Atlas diesels have been improved and output increased in several models.

The first engine to be sold with an increased output is the Superior Model 65 formerly rated 1765 hp. The original design of this engine was not changed. Improvements in turbocharging and exhaust manifolding permit a new rating of 2000 hp for this model. In addition there is an ample reserve still available in this 8-cyl engine.

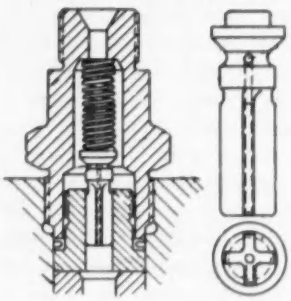
The new engine has been bought by Price Bros.-McClung, Inc. of Toledo, for repowering their 80 ft x 32 ft dredge "Three Brothers". This new engine is to replace another Superior diesel which has successfully powered the dredge for 20 years. The extra horsepower is expected to greatly improve the dredge capacity.

Development, building and delivery of the new engine was accomplished in record time by the White engineers and production crew. The reason for the big hurry was that the dredge company had to meet a deadline on contracts for harbor and channel improvements. These improvements are part of the Toledo industries' current expansions to allow for the economic effects of the St. Lawrence Seaway.



New air-cooled Diesel Power, Inc., engine on test is shown driving centrifugal pump.

Thaheld's delivery valve improving starting and low speed operation is shown in assembly and in detail.



Air-Cooled 8-HP Diesel Announced

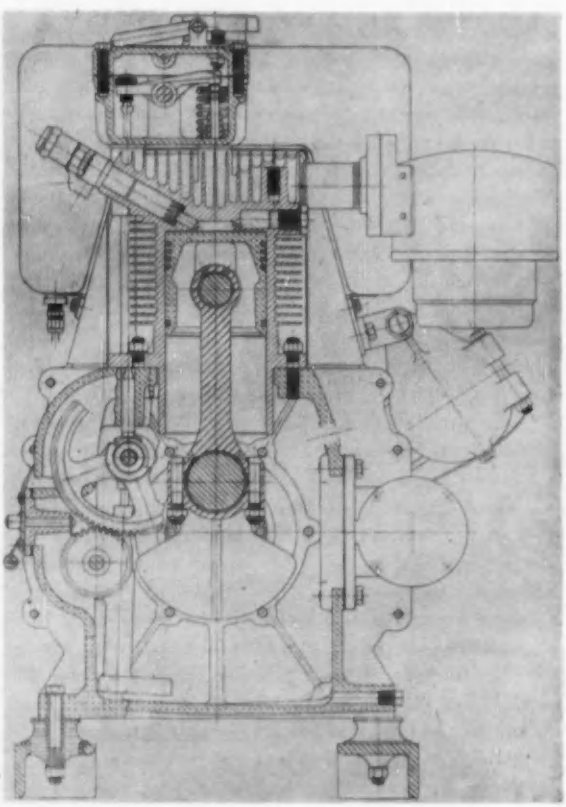
Light-weight engine with new combustion chamber and injection system features to compete for low horsepower applications.

A LIGHT-WEIGHT, air-cooled, 8-hp diesel engine designed by F. A. Thaheld has been placed on the market by its manufacturer, Diesel Power, Inc. This engine is intended for use in driving small pumps, generators and any other every-day application where its horsepower is adequate.

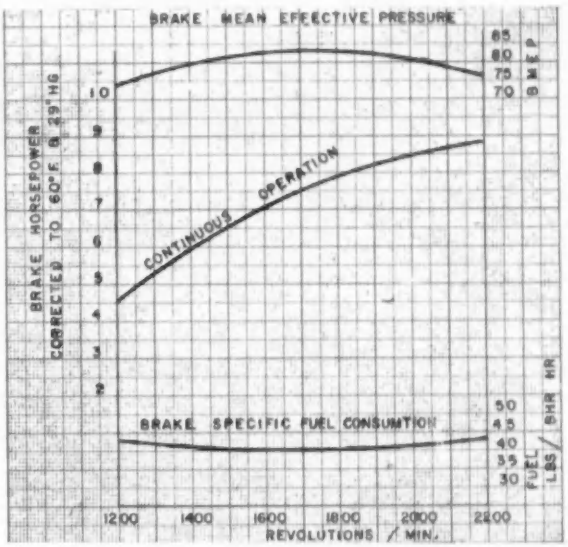
Applications such as pumping and generating units in remote and inaccessible locations will be special targets for the sale of these engines. Isolated radio, radar, telephone and telegraph stations, where problems exist in water cooling and transportation of heavier engines, are additional possibilities for its use.

The fact that a Brazilian firm, Companhia de Anilinas, has contracted to build a minimum of 1000 engines for the first year is evidence of foreign interest in this engine. One of its end uses in Brazil, will be as the source of power for water pumping and operations where diesel economy is an important factor.

As for the dependability which installations of this type must necessarily have, Diesel Power, Inc. points to one engine which while on test has had over 4000 hours of trouble-free continuous operation. This has been accomplished in temperatures ranging from 20°F below zero to more than 90°F. According to Diesel Power, Inc. this engine will continue to be operated until it fails. They estimate that this will take about 10,000 hours. As for a few facts about the engine, let us take a look at the specifications.



Model	A-141
Horsepower at 1800 rpm	8
BMEP	83 psi
Displacement	41 cubic inches
Cycles	4
No. of Cylinders	1
Bore and Stroke	3¼" x 3¼"
Compression Ratio	17 to 1
Specific Fuel Consumption (full load)	0.40 lbs/bhp hr.
Cooling	Air-cooled
Crankcase Lube Oil Capacity	3 Quarts
Fuel Injection Pump and Injector	American Bosch
Fuel Filter	Fram
Air Filter	Air-Maze
Dry Weight (less starter and generator)	235 lbs.
Overall Height	29 inches
Overall Length (with clutch and power take-off)	36 inches
Overall Length (without clutch and power take-off)	29 inches
Overall Width (with starter and generator)	23 inches



Manufacturer's performance curves are given for Model A-41-1, 3¼"-bore, 3¼"-stroke, air-cooled engine.

This engine, compares in power with 500-pound water-cooled models of some competitors. The fact that this engine is air-cooled, plus its liberal use of aluminum alloys for such parts as crankcase and blower, considerably reduces its weight.

Thaheld claims that his new and improved combustion chamber design, has reduced the firing pressure to that of the gasoline engine. According to tests performed by the California Institute of Technology, the firing pressure is about the same as the compression end pressure. For this reason Diesel Power, Inc. claim that their engine has long life for connecting rod bearings, main crankshaft bearings and all reciprocating parts.

Thaheld's energy cell has also given the additional benefits of more uniform combustion chamber temperatures and better fuel economy. Further advantages have been obtained by Thaheld's improvement of the delivery valve design in the fuel injection pump. How this delivery valve was improved and the benefits gained will now be discussed.

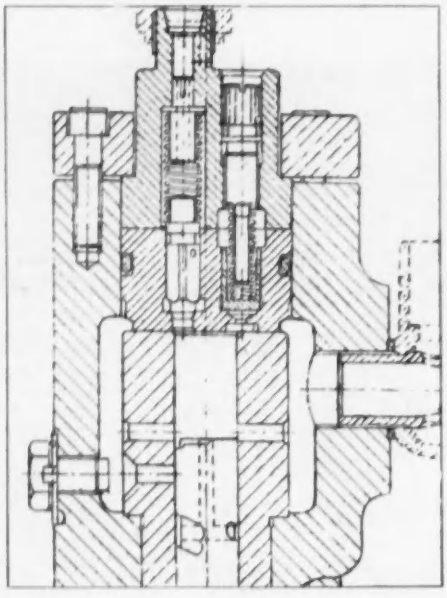
When starting a diesel, the control lever is set to deliver a larger quantity of fuel than would normally be required. This facilitates starting. However, when this fuel ignites, the engine races until the control mechanism can cut down the amount of fuel. The improved delivery valve is designed to automatically prevent this engine racing after starting. It also acts as an automatic governor when the engine is idling preventing undesirable speed fluctuations.

The improvement consists of a by-pass or supplementary passage in the fuel delivery valve which connects with the bore above and below the lapped piston on the delivery valve. The by-pass includes an axial hole drilled vertically through the center of the delivery valve and a lateral port drilled into the central hole. The size of the hole and the port controls the amount of fuel passing through when the valve is unseated.

Actual performance shows that this supplementary passage makes starting easier. Under relatively slow cranking speed, the delivery valve moves up and down in the bore at a correspondingly slow speed. During this slow movement, the supplementary passage acts to deliver an increased amount of fuel for each power stroke of the engine piston. When the fuel is ignited the engine crankshaft accelerates to operating speed rapidly. This rapid increase in crankshaft speed is reflected in faster reciprocation of the pump plunger and therefore the delivery valve.

Under normal or high speed operation, the effect of the supplementary passage becomes negligible, since the time required to pass fuel through the passage becomes shorter and shorter as the engine speed increases. The supplementary passage also acts as an automatic governor insuring injection of sufficient fuel to maintain proper idling speed. When the speed tends to fall below a safe value, the effect of the supplementary passage is to supply additional quantities of fuel. This increases the speed to the safe minimum idling speed without stalling. Should the proper idling speed be exceeded, the effect of the supplementary passage is to decrease the fuel injected and therefore the speed.

With the advantages gained from the use of Thaheld's combustion chamber and delivery valve designs, plus the fact that it is air-cooled and light-weight, this engine could be quite competitive in its field and horsepower range.



Section thru upper part of dual-fuel pump showing delivery valve at top left of plunger barrel and the adjustable displacer piston assembly at top right.

Bendix Fuel Injection Pump for Dual-Fuel Service

Features include accurate metering of minute pilot oil quantities, variable pilot injection timing, plus compensation for leakage and other variations.

IN the early phase of dual-fuel engine development various problems come up when using some of the then-existing conventional fuel injection pumps. One difficulty was in trying to make some of these pumps inject minute quantities of pilot oil at a constant rate for long periods of time.

The amount of pilot oil required by dual-fuel engines is only one third that necessary for straight diesel engines operating even at idling. This need for such tiny constant quantities of pilot oil made it hard for some injection pumps to be applied satisfactorily for dual-fuel operation. Some of these pumps were also quite sensitive to leakage factor, speed and other variations.

To complicate matters further a fuel injection timing problem arose. On some dual-fuel engines better fuel economy is obtained by retarding injection timing when going from straight diesel to full gas load and by advancing timing when dropping from full gas load to part gas load. This change in timing amounts to about six to eight crank degrees.

Various methods were tried by industry to solve these problems. Some of the schemes included two distinct sets of pumps and injectors, one pump and two injectors and one pump with double plungers with one injector per cylinder. Obviously most of these are rather expensive and complicated.

The Bendix engineers' idea was to modify the pumps they had been using and keep the injection equipment as simple and inexpensive as possible. They could see no valid reason why the operating range of a simple single plunger pump could not be extended downward to include the pilot oil delivery requirements. So proceeding on this basis the result was the development of a dual-fuel pump that was almost identical with its counterpart for straight diesel operation except for the delivery valve. It was primarily the development and redesign of this delivery valve that made possible the success of the simple Bendix dual-fuel injection system.

This Bendix dual-fuel pump, made in two models the FDXS-22 and FDXS-24, solved all of the above mentioned problems. It meets the pilot oil quantity requirement and has variable timing.

The timing variation occurs during the fuel pump rack movement. The pilot oil range is between 5 and 15 mm. rack. While the rack is being moved the fuel quantity delivered is maintained constant. In order to obtain constant pilot oil delivery while varying the rack position it was necessary to build into the plunger the corresponding constant displacement. This was accomplished by making the port closing and port opening control edges on the plunger more or less parallel with each other.

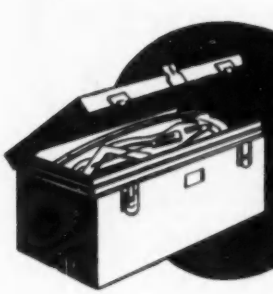
With this type of plunger constant delivery can be obtained at a certain speed but due to speed variations, the varying leakage factor, and the changing fuel cam positions, the discharge quantity does vary somewhat. Therefore some device was necessary to compensate for such variations. For this purpose the so-called displacer piston was added.

This displacer piston permits adjustment for all of these variations and secures the desired fuel delivery to suit the various operating conditions. Furthermore this device becomes very handy for adjusting for slight variations caused by the installation of a new plunger or to compensate for the natural wear that may occur after months or years of service.

The displacer piston allows a longer plunger stroke thus avoiding some of the port control problems inherent in very short effective strokes. Piston motion absorbs the excessive fuel until it hits its adjustable stops. The rest of the fuel is delivered. If it hits the stop sooner, delivery is increased and vice-versa.

Piston adjustments have no appreciable effect on full load fuel, exhaust temperature or firing pressure if the piston stroke does not exceed 0.200-in. One full turn of the piston adjusting screw will change piston lift by 0.050-in.

Variations in delivery with a single adjustment on the displacer piston can be obtained at four different speeds.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Locating TDC for Pistons in Vee-Type Engines

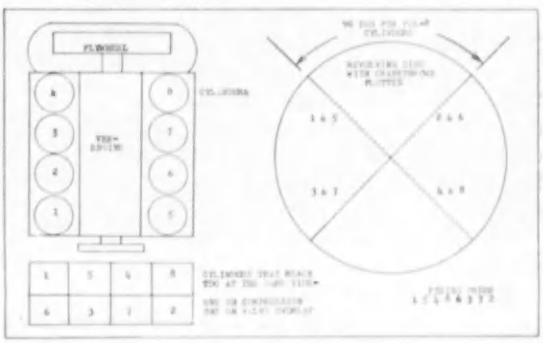
ROY M. SMITH, PRINCETON, ME.—When setting valves or doing some forms of trouble shooting, the piston should be at or very close to top dead center (TDC).

In 4-cycle engines of six or more cylinders, two pistons reach TDC at the same time, with one on compression and the other at valve overlap position. If you know these two pistons, you can use the one on overlap position as a guide to TDC on the one you're interested in.

For example, on a 6-cyl, in-line engine with a conventional firing order, pistons 6 and 1, 5 and 2, and 4 and 3 come up at the same time. But if the intake valve on No. 6 is opening while the exhaust is closing, No. 6 piston is having valve overlap therefore No. 1 must be on compression and ready for valve setting. Both valves on No. 6 would move at the same time when rocking the flywheel.

This is true of any engine where two pistons reach TDC at once, including the vee-type. To make sure that the piston being checked is not 180 deg out, and to save time in turning the engine over, I use a cardboard disc and plot on it the pistons which are up at the same time. The order in which the crankthrows come up on an 8-cyl, vee-engine, for example, are laid out on two lines drawn at the same angle (most 90 deg) as the cylinders. This order can be determined in several ways. One method is by checking the sequence of valve overlap.

As shown on the illustration, when rotating the disc



clockwise, pistons 1 and 6, 5 and 3, 4 and 7, and 8 and 2 reach TDC at the same time. Assuming, that as shown in the illustration, 1 and 6 are on TDC with piston 1 on compression, if rotated clockwise the disc will show that 5 and 3 reach TDC next with 5 on compression, 4 and 7 next with 4 on compression etc., according to the firing order 1,5,4,8,6,3,7,2.

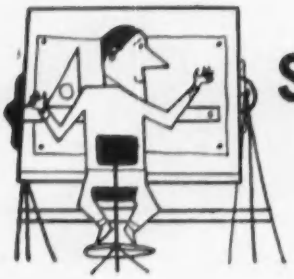
Note that this system, of using the valve overlap position on one of the two pistons on TDC to determine compression TDC for the other piston, applies only to 4-cycle engines. This system is useful even when the flywheel is marked for TDC position because the marks don't tell you which piston is on compression. Editor.

Plastic Bottles Stop Waste

TOM PERERA, NEWARK, NEW JERSEY—Here's an idea for your Tool Box section that may be helpful to many shops. In rebuilding engines we use Lubriplate on all mating surfaces. When we first started using this product it was purchased in 25-lb containers. This was fine from the cost standpoint but we found that after using a container for some time, a collection of nuts, bolts, lockwashers and dirt found its way into the container. We couldn't keep the stuff clean.

The next step was to go to Lubriplate in tube form. Immediately the price jumped because of the type of special packaging. I found the solution when I was sitting in a restaurant one day squeezing ketchup from a plastic bottle.

Now I have supplied enough squeezeable plastic bottles to take care of each mechanic plus several for the parts department. When a bottle is empty the mechanic simply turns the empty into the parts department and obtains a full bottle from stock. The parts department refills the emptys from containers which they keep clean and places the refilled bottles in stock until needed by another mechanic.



service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

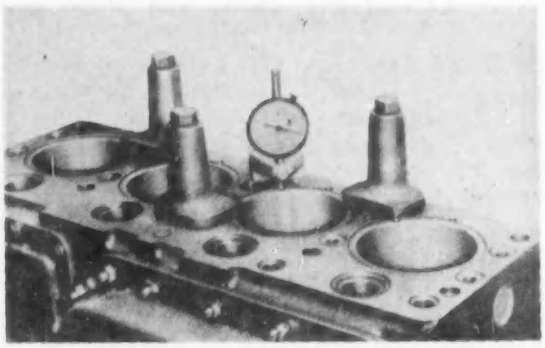
Cylinder Hold-Down Clamp Sets for GM Series 51, 71 and 110 Diesels

Two new Cylinder Liner Hold-Down Clamp Sets, J5518 and J5682, are now available. They are used to hold the liner flange tightly against the seat on the cylinder block while checking the distance between the top of the liner flange and the top surface of the cylinder block.

This distance is checked by use of Cylinder Liner Gauge Block, Tool J4209-25, along with Dial Indicator, Tool J4209-22, both of which are components of Diagnosis Test Kit, J4209-41.

The clamps are also used to hold the liners in the block during engine overhaul. They are particularly useful in preventing liners from being pushed out of the block when the crankshaft is rotated with the pistons and connecting rods in place in the liners.

Tool Set J5518 is used for Series 51 and 71 engines. Set J5682 is used for Series 110 engines. Each set includes seven clamps.



When measuring the distance between the liner flange and the top surface of the cylinder block a clamp should be used on each side (about 180 deg apart) of the liner as shown in the illustration.

To hold the liners in place during overhaul only three clamps are used on 6-cyl engines, two clamps on 4- and 3-cyl engines and one clamp on 2-cyl engines.

On Series 51 engines, the cylinder liner flange should be 0.029 to 0.033-in below the top surface of the cylinder block.

On Series 71 engines of the current *high-block* type the liner flange should be 0.046 to 0.050-in below the top surface of the block. On Series 71 engines of the *low-block* type the liner should extend 0.002 to 0.006-in above the top surface of the cylinder block.

On Series 110 engines the liner flange should be 0.050 to 0.054-in below the top surface of the block.

The difference in liner height between any two adjacent liners should not exceed 0.002-in.

Orders for these clamp sets should be directed to the Kent-Moore Organization, Inc., General Motors Building, Detroit 2, Mich.

International Harvester TD-24, U-1091 and UD-1091 Push Rod Side Cover and Crankcase Breather Leakage . . .

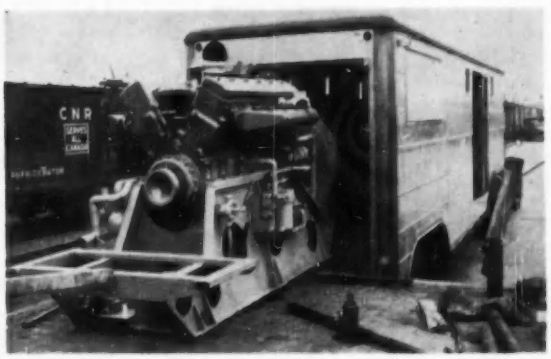
New die-cast aluminum push rod side covers with an improved crankcase breather are currently available under Nos. 273069-R91 (front) and 2703070-R91 (left).

Oil carryover through the crankcase breather tube and leakage at the side cover gaskets can be minimized by the installation of aluminum covers. This is made possible by the use of a breather tube having twice the capacity of the old tube and a new breather body and baffle that will trap the oil and return it right to the crankcase.

The cast aluminum cover provides a smooth flat sealing surface greatly increasing its sealing capacity. A new gasket should be used and the covers torqued to 7-10 ft lb.

With the new larger tube, normal crankcase blowby will be a great deal less apparent.

news of our industry



Mobile Diesel Generators for B. C.

Two 35-ft trailers, each housing a 12-cyl, vee-type, 730-hp, 1200-rpm Mercedes Benz diesel driving a 500-kw Canadian G. E. generator, have been bought by the British Columbia Power Commission. They'll be used to supplement any of the 19 diesel stations operated by the commission or in case of emergency. The trailers can be hauled by tractor trucks or loaded on rail cars.

These mobile power-plants are equipped with auxiliary lighting plants, floodlights, fire-fighting equipment and tools. They carry fuel for 24-hr operation but usually use fuel from the stationary plant. Trailer lighting and heating are automatically transferred to the auxiliary lighting plant when the main unit is shut down.

The generators are re-connectable at 2400, 4160, or 12,480-v, making them adaptable for use in any of the Commission's 29 power districts.

Mack Trucks to Open New Truck Center

Complete facilities for immediate diesel and gasoline engine service will be offered by Mack Trucks at their heavy-duty truck service center now under construction in Richmond, Va. It is to be completed in May.

Located on Ninth Street Road, adjacent to U. S. Routes 1 and 301, as well as 360 and 60, it will be available for use by all trucks traveling the main north-south arteries. It is designed to meet the growing demand for additional truck service facilities along the busy north-south traffic routes.

The ultra-modern $350,000 brick and concrete structure will contain about 25,000 ft of floor space. In addition to complete facilities for diesel and gasoline engine maintenance and repairs it will have a parts department, showroom and office space. Ample parking space will be available in a 160,000-sq ft parking lot.

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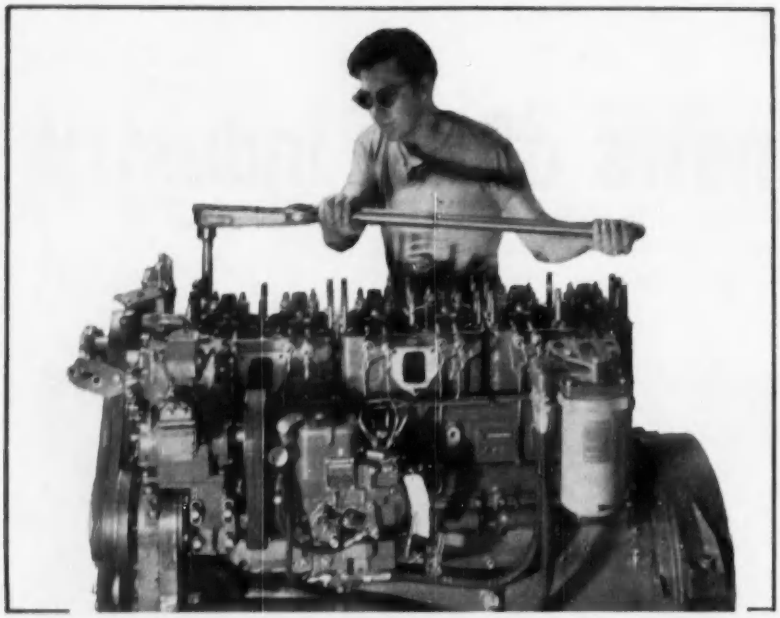


you can't check air pressure by kicking a tire

. . . And you can't check bolt tension by "wrist feel."

FREE . . .

BOOK OF TORQUE SPECIFICATIONS

Your *Snap-on* man will be glad to give you a valuable free book listing torque specifications covering all makes of cars, trucks, tractors and industrial engines. Ask for it along with new *Snap-on* tool catalog or write direct to *Snap-on*.

That's why top mechanics depend on the *Snap-on** torqometer to take the gamble out of every operation where bolt tension is specified, like take-up on main bearings, cylinder heads, connecting rods and manifold nuts.

And there's nothing to it. Set the adjustable dial at the bolt tension specified by the manufacturer and tighten until the easy-to-read pointer reaches zero or the bulb on the flash model lights.

Snap-on builds 39 torqometer models ranging in torque capacities of from 0-30 in. lb to 0-4000 ft lb and 0-35 c. kgs. to 0-280 m. kgs. Let a *Snap-on* man show you its advantages by demonstrating a torqometer on your job. He will help you choose the right model for your specific needs.

*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION

8064-B 28th Avenue • Kenosha, Wisconsin

news of our industry

Truck Hauled Freight Increases

There's good news in the American Trucking Associations, Inc., announcement that the volume of intercity general freight hauled by truck in Nov. 1955, topped that of Nov. 1954 by 17%.

Although each of the Nation's nine geographical regions experienced this increase the highest gains were in the Central region, 24.7%, Midwestern region, 21.8% and Northwestern region, 18.3%. It is in these regions that carriers are predominantly diesel powered.

AERA Counterpart in Europe

A counterpart of the Automative Engine Rebuilders Association has been set up in Europe. Delegates of many European countries' engine reconditioners met in Paris recently. When they found that they had so much in common and that exchange of information solved many problems they decided to form a permanent group.

From now on they will hold meetings regularly and exchange technical data. The AREA has also been given an invitation to attend.

More KW's for ALCOA Smelting Works

Twenty-six more Nordberg spark-ignition gas-burning radial engines are now being installed in the ALCOA smelting plant at Point Comfort, Texas. These 26 units of 2125 hp each will give this plant a total of 220 Nordberg radial engines.

With a maximum capacity of over 400,000 hp. this is by far the world's largest internal combustion engine power station.

Built in Nordberg's Milwaukee factory, the first 11 engines of the new order were shipped by barge to the installation site on the Gulf Coast of Texas. The John I. Hays Co. was in charge of the shipment moving the engines over 2,000 miles in 17 days.

news of our industry

Ten Million Trucks in Use Today

Trucks in use in the U.S. passed the 10 million mark in 1955.

An estimate of the number of truck registrations shown by the American Trucking Associations' annual publication, "American Trucking Trends", shows there are now 9,675,000 privately-owned trucks. Add to these the 430,937 government trucks (not including military vehicles) and you have a total of at least 10,105,937 trucks of all sizes.

About 5 million of these trucks are operated by manufacturing, mining and wholesale companies. Some 3 million are in the farm truck classification. The rest are for-hire carriers.

"Trends" shows there were 2640 Class I motor carrier companies in 1954, the latest year for which ICC figures are available. A Class I motor carrier is one having an annual gross revenue of $200,000 or more.

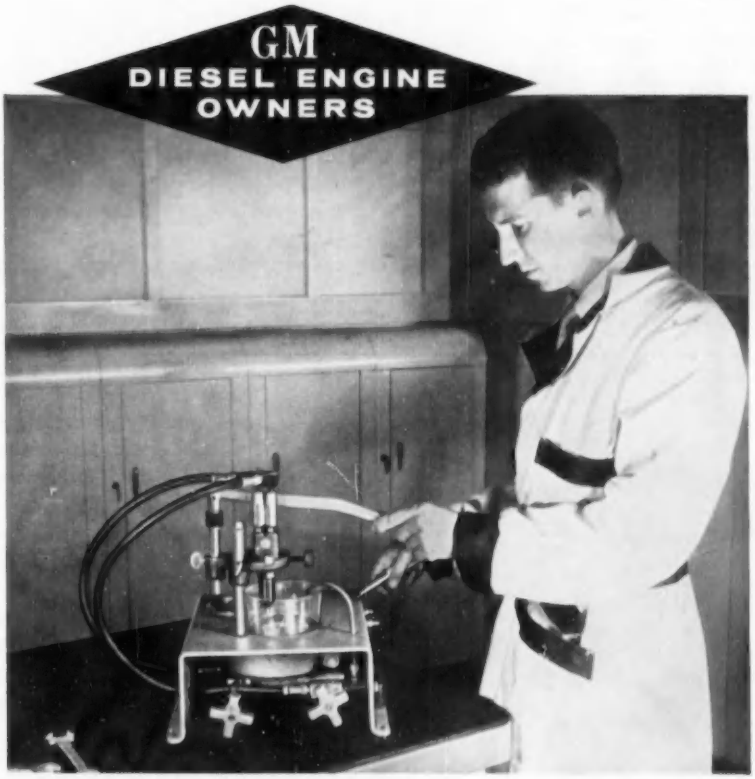
In 1954 trucks traveled 68,374,000,000 miles. This does not include intercity vehicle miles through urban places. The total was only about 45 million miles more than in 1953 but it was twice as far as trucks traveled in 1944 only 10 years before.

In 1954 trucks paid more taxes than ever before, a total of $1,750,500,000. This includes state registration fees, state motor carrier and trailer fees, state gasoline taxes, Federal excise taxes, special city and county taxes and bridge, tunnel and ferry tolls.

ASTM Committee Week

The ASTM will hold its 1956 committee Week and Spring Meeting at the Hotel Statler, Buffalo, N. Y. from February 27 to March 2. More than 250 ASTM technical committees and their sub-committees are expected to meet to discuss and review the work they have done during the year.

This is in preparation for the completion of their year's work to be reported at the annual meeting in June.



NOW! One Tester for ALL GM Diesel Injectors!

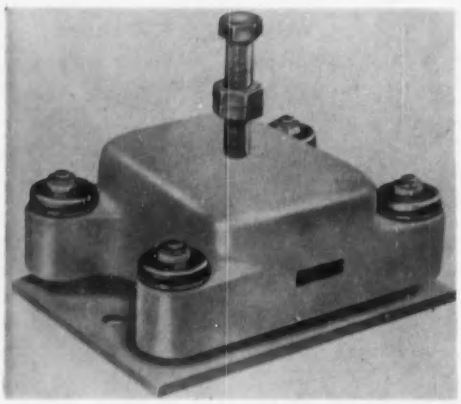
IT'S THE NEW KENT-MOORE *RATE-MAKER*® INJECTOR TESTER FIXTURE

Yes, now for the first time you can check *all* GM Diesel Injectors on *one* tester! That's right. The six tests specified for all Series 51, 71 and 110 engine injectors can be performed quickly and easily on the new Kent-Moore Injector Tester . . . and there are no special conversion units or individual holding fixtures to bother with either! Consider, too, some of the Tester's other outstanding features . . . a clear view plastic container that permits safe, unobstructed observation of the spray pattern . . . a positive lock, fine-adjustment popping handle for greater accuracy in checking leaks at pressures higher than the normal valve opening pressure of the injector . . . a fine mesh screen and ten-micron filter to guard against fuel system contamination . . . a sturdy 3,000 pound gauge with "lazy" hand for faster testing . . . oil resistant hoses and nylon-sealed connector fittings to insure long tool life. All these features, and many more, make it easy to see why the Kent-Moore Injector Tester is specified in your maintenance manuals. Order yours today!

The complete J 7000 Injector Tester, as illustrated at right, includes the basic testing instrument, J 5764, plus three adapter sets . . . J 7051-1, J 7071-1, J 7110-1 for testing Series 51, 71 and 110 injectors respectively. The adapters are offered separately for purchase in any combination desired. For complete information, write Kent-Moore direct today!

KM® **KENT-MOORE ORGANIZATION, INC.**
5-105 General Motors Bldg. • Detroit 2, Michigan
ENGINEERS AND MANUFACTURERS OF SPECIAL AUTOMOTIVE SERVICE TOOLS AND EQUIPMENT

new products



Steel Spring Vibration Mountings

Maximum damping against shock and vibration is said to be featured in the new line of heavy-duty steel spring vibration mountings developed by T. R. Finn & Co., Inc. These Finnflex type SB mountings consist of a cast semi-steel housing containing helical steel springs, rubber thrust bumpers, nylon dampers and a steel base plate with sway control assemblies. A dual-purpose bolt secures mounting to the machine and provides means of leveling.

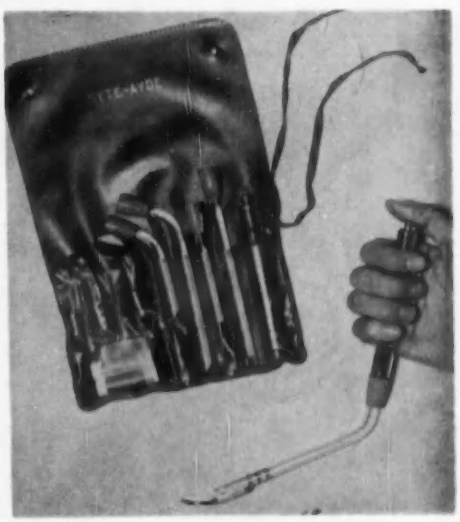
Nylon lined, pre-compressed, cylindrical rubber bumpers absorb thrust in any horizontal direction. The nylon liners protect the rubber from abrasion and assure stiffness. Maximum amount of damping is also given by the nylon liners which being provided with wear compensating gaps are pressed snugly around steel studs by the pre-compressed rubber bumpers. All wear is taken up and adjustment is maintained automatically. Rated load capacity ranges— from 100- to 6500-lb.

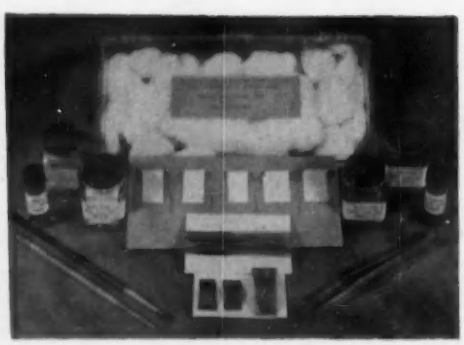
Multi-Purpose Inspection Light

Inaccessible or hard to see areas can now be closely examined by an inspection light which is said to bend light around corners. This is done by means of a combination light-focusing rod and magnifying mirror. This device is made by the F.T.S. Corp. and is available in kit form under the trade name Syte-Ayde.

The light for the Syte-Ayde is provided by a pen-sized flashlight. A detachable lucite rod transmits and focuses this light on the spot to be inspected. Easy viewing of the area is then possible through a magnifying mirror on the end of the rod. The complete kit contains a flashlight with lock-switch, two batteries and bulb, four detachable lucite rods and three detachable angle form mirrors.

Most common applications for this unit are for general maintenance and repairmen working in inaccessible places, tool and die makers, die setters and set-up men for checking clearances, parts inspectors, instrument men, etc.





Strain Gages Measure Up to 1800°F.

Resistance type strain gages that can measure up to 1800°F. have just been put out by Baldwin-Lima-Hamilton. These SR-4 gages consist of an etched foil grid 0.0005-in thick on a temporary carrier which is stripped off when applying them. They're made in sets of 10 having a resistance within plus or minus 0.2 ohm of each other.

Tests show that the gages can be used in static tests up to about 1100°F. Above this the gages can be used only for dynamic tests. They are offered only for experimental use and without guarantees.

new products

Roller Bearing Design Change

So that they may be more efficiently lubricated, all spherical roller bearings 240 mm (9.4488 in) O.D. and larger made by SKF Industries, Inc., will be equipped with lubricating holes in the outer ring. This will be done at no additional cost to the customer.

Having a flow of oil from the middle of the bearing toward the outside instead of from the sides toward the center flushes out old lubricant and with it any abrasives, dirt, moisture or other impurities. Entry of dirt is also prevented and oil reaches all working surfaces easier.

Combination Alternator and Welder

As a combination AC power supply and AC welder, The Lincoln Electric Co. portable "Welanpower" is now available for a wide range of arc welding and emergency power needs.

As a welder it gives 200 amp AC for welding, hard-surfacing, soldering, brazing, torch heating and cutting.

As an AC power unit it supplies 4 kva for continuous duty and 5 kva for intermittent standby service. The AC power is 230/115 volts, 60 cycle, single phase.

Electric current for both welding and power supply is available at the same time.

Heavy-Duty Clutches

Developed and field tested by engineers of the Rockford Clutch Div. of Borg-Warner Corp., new type heavy-duty clutches are now offered under the trade name, "Morlife".

It is said that the extra tough characteristics of the Morlife clutch plates are better adapted for tractors, trucks, cranes, shovels, bulldozers and other heavy-duty machines.

It is claimed that in addition to giving up to 100% more torque capacity, the work life of these clutches has been increased about 400% while cutting time for adjustments or replacements to one-fourth.

Heat dissipation has also been improved thus eliminating excessive burning or warping of clutch plates.

Regulator Ratings Increased

Six new higher ratings of single-phase distribution regulators designed to lower costs in distribution regulation have been announced by Allis-Chalmers Mfg. Co. It is claimed that they can be engineered into most utility systems.

The new regulators are designed to carry 160% rated load not to exceed 400 amp at plus or minus 5% regulation.

A-C has also redesigned the core, coils and insulation of current transformers for use in their 600, 4160 and 12,800-v switch gear. The construction gives better heat dissipation, increased dielectic strength and makes it easier to install or replace.

The World's Leading Manufacturers of FUEL INJECTION EQUIPMENT *for* *Diesel Engines*

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Sales Office: 14820 DETROIT AVENUE, CLEVELAND, OHIO

AP 174-755

new literature

"Standards of the Hydraulic Institute",
a manual just off the press, is arranged in five sections; A. General, B. Centrifugal Pump, C. Rotary Pump, D. Reciprocating Pump and E. Data. Section A gives brief information about the Institute and its published Standards. Sections B, C, and D cover classes and types of pumps, nomenclature, general information, application and rating standards, test code and installation, operation and maintenance instructions. Section E consists of tables, curves etc.

Engineering Data
and size dimensional information on Watson-Stillman Fittings Division's forged stainless and alloy steel fittings has been published in the new 8-page bulletin, S-1-55.

Latest Panelboards
are discussed in a new 75-page catalog which includes 20 pages of installation and selection data. It has been released by the Federal Pacific Electric Co. Among engineering data in this catalog titled "Modern Panelboards" is information on transformer connections for distribution voltages, National Electrical Code and Underwriters' Laboratories requirements and circuit breaker characteristics.

Hydraulic Valves
solenoid controlled and panel mounted are illustrated and described in the new Catalog No. 261 published by Rivett Lathe & Grinder, Inc. This 8-page automatic valve catalog emphasizes features of construction and operation with cut-away views, piston designs, spools, J.I.C. symbols etc.

Capacitor Type Fuel Gages
are covered in a new booklet made available by The Liquidometer Corp. It describes true weight gaging systems, compensated and uncompensated capacitor type fuel gages, repeater indicators, fuel gage totalizing systems, selective indicators and thermister applications for fuel level warning and control.

"How Torque Converters on Shovels Increase Efficiency"
is told in story form, complete with charts and on-the-job pictures, in the Twin Disc Clutch Co., "Production Road", Vol. 17, No. 4. Timely tips on efficient power transmission are also given.

Vibration Control Material
Isolant, is described and illustrated in a catalog just released by T. R. Finn & Co., Inc. This catalog No. IS-55 gives the types, load ranges, standard sizes and thicknesses of Isolant with suggested specifications.

Here's Why
PERFORMANCE IS BETTER
WITH Bendix
STARTER DRIVES

CHECK and COMPARE THESE FEATURES

- Starting motor can be mounted more easily and in more positions.
- Requires no actuating linkage—solenoid can be placed in any convenient position.
- Simple in design—has fewer parts—needs fewer adjustments.

It takes a truly outstanding product to receive over 100,000,000 endorsements. Yet, that's the number of Bendix Drives that have been installed. No other starter drive approaches this record of outstanding performance. That is why, whatever your type of diesel or whatever its purpose, it will pay you to specify Bendix* Starter Drive for the most economical installation and dependable performance. *REG. U.S. PAT. OFF.

ECLIPSE MACHINE DIVISION of Bendix AVIATION CORPORATION
ELMIRA, NEW YORK
Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N.Y.

THE BUNKER FUEL OIL YOU USE MAY NEED AN ANTIDOTE

You won't see this label on tank cars, but the fuel may be "POISON" to your boilers, diesels, or gas turbines.

High temperature corrosion, caused by sulfur, vanadium and sodium is a major problem to operators of high pressure boilers, gas turbines and diesel engines.

For details, how BARSAD will prevent this corrosion, write a line about your problem to R. S. NORRIS & ASSOCIATES, Larchmont, New York.

BARSAD

Pat. Pending

new literature

Allis-Chalmers' Deflection Indicator
bulletin explains how it safeguards drive shafts, etc., by detecting and warning of any excessive or unnatural movement. This 8-page bulletin shows various applications for the magnetic-amplifier type deflection indicator and how it sounds alarm.

Low-Impedance Enclosed Bus-Bar
System construction and application is discussed in a new 16-page, two color bulletin issued by the Distribution Assemblies Dept. of the General Electric Co. Ratings, weights, dimensions, installation data and guide from specifications are also included.

Users of Packing, Oil Seals,
insulation tape, etc., will be interested in the 8-page bulletin describing the complete line of silicone rubber products made by the Garlock Packing Co.

Link-Belt Company's Gearmotors
and Motogears are illustrated and described in their 28-page book No. 2447, which also includes selection data, construction features, load classifications, dimensions tables, etc.

"Let's Talk Nuts and Bolts"
is the title of a booklet put out by Caterpillar Tractor Co., which discusses the difference in nuts and bolts and lockwashers.

If you need Bronze Pumps,
Ampco Metal Inc. describes its complete line in a bulletin entitled "Ampco Centrifugal Pumps". These pumps are said to handle corrosive and erosive materials previously requiring special-built pumps.

Multi-Purpose Portable Lifts
are detailed in a new 8-page brochure from the Oster Mfg. Co. This booklet shows various types of manually propelled, hand and battery-powered hydraulic lifts with capacities from 500 to 2000 lb.

Automatic Controls Sets
for starting and stopping diesel engine driven equipment are illustrated and described in Catalog No. 5 just released by Synchro-Start Products Inc. Other equipment covered include overspeed and underspeed sensitive switches, temperature and pressure switches, visual and audible alarms, special control panels, and D.C. solenoids for throttle, clutches, etc.

Closed Liquid Level Measurement
and control is detailed in an 8-page bulletin just issued by The Foxboro Co. How this is accomplished by use of the Type 13 LA d/p Cell Liquid Level Transmitter is explained.

Lefax's Technical Data Catalog for 1956
has just been announced by Lefax Publishers. This newly revised catalog lists pocket size technical data reference books which cover every branch of engineering.

organizational news

Mack Trucks' Promotions

have made Andrew J. O'Rourke vice president and manager of Mack Trucks' Eastern Div. and John T. Klien, district manager in Kansas City. These announcements were made by Lewis E. Minkel, vice president and sales manager.

SAE's New President

is George A. Delaney, chief engineer of GM's Pontiac Motor Div. He has long been active in the SAE, being a member and chairman of the Society's Technical Board and holding other important posts.

C. F. Andreae

M. W. Bever

Another Distributor

for GM's Detroit Diesel Division's industrial diesels is Peninsular Diesel, Inc. of Detroit. Clarke F. Andreae is the president and M. W. Bever is the secretary, treasurer and diesel manager of this newly established company.

The Retirement

of Lee J. Hoffman, manager of the Franklin Plant of Chicago Pneumatic Tool Co., completes 46 years of service to the company's air compressor and diesel engine division. However he will continue in his elected post on the board of directors. Mr. Hoffman has been succeeded at Franklin by H. E. Moore.

Merger of Two Engineering-Construction

firms has been announced. Now the McWilliams Dredging Co. and W. Horace Williams Co. are the Williams-McWilliams Industries.

SINCE 1907

PARK

The Symbol For

QUALITY DIE FORGINGS

DIESEL CRANKSHAFTS

and Miscellaneous

DROP FORGINGS

Weighing Up to 4,000 Lbs.

THE PARK DROP FORGE CO.

Gordon Park at E. 79th. Cleveland 3, Ohio

AMOT SAFETY CONTROL

AMOT Model 1476-47 automatically shuts down engine on high water temperature or low lube oil pressure. Features are:

1. No capillary tube and bulb used.
2. Uses well known AMOT element.
3. Several temperature sensing units can be used with one control unit.
4. Will operate an air whistle.
5. Will operate a diaphragm gas valve for large gas engine shut down.
6. Will operate as a diesel fuel shut off valve.
7. Available with 2" direct connected gas valve.

AMOT CONTROLS CORPORATION

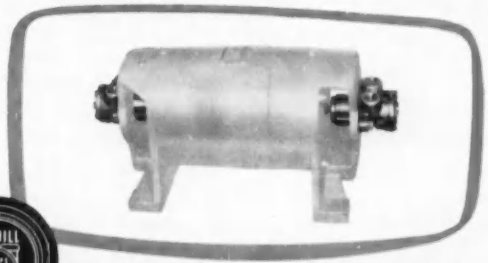
RICHMOND 1, CALIFORNIA

It's Just the PUMP You Want
...for FUEL TRANSFER and
HYDRAULIC GOVERNOR SERVICE

TUTHILL
Model L

It holds its prime. It's mechanically sealed and leak-free. It's quiet in operation. It's low in power consumption. And it's built to give years of uninterrupted service. That's why the Tuthill Model L positive displacement, internal-gear rotary pump is preferred for fuel transfer and hydraulic governor service. Capacities from .33 to 6 g.p.m. in wide pressure ranges.

Write for Catalog No. 101 for complete details.



TUTHILL PUMP COMPANY
Dependable Rotary Pumps . . . since 1927
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Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

KIENE®
DIESEL
indicator valves

OPERATES AT PRESSURES UP TO 10,000 PSI

Kiene valves have effective gas seal both open and closed without packing or glands. Operate against pressure — will never blow open. Small and rugged — 4¼" in length with only 3¼" circle of space for attachment. Kiene valves give better service under the most severe conditions. Standard indicator plug and wing nut connection.

Furnished with male ½" NPT engine connection. Other threads on order. Adaptations for most diesel locomotive engines.

SEND FOR BULLETIN V-10

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

Viking Instruments' Plan

to double plant production facilities at East Haddam has been announced by its president Alan Davis.

Allis-Chalmers Elections

have established Willis G. Scholl as executive vice president, Boyd S. Oberlink as vice president in charge of Tractor Group and E. J. Mercer has been appointed general manager of the Construction Machinery Division.

B. S. Oberlink

E. J. Mercer

Clyde A. Sattley

who is said to be one of the most important figures in establishing diesel motive power on U. S. railroads has died at the age of 90. He served as EMD's Chicago regional manager until his retirement in 1946. At this time he was 81, 16 years beyond the later-established salaried retirement age.

Newly Elected Head of Tuthill

Pump Co. is James G. Tuthill grandson of the founder of the company and son of the late chairman for the board. He succeeds H. T. Kessler as president.

W. G. Scholl

J. G. Tuthill

E. J. Tribble

A. M. Tullo

Elected as Vice Presidents

of the Worthington Corp., E. J. Tribble and A. M. Tullo take on added responsibilities. Mr. Tribble will now have general supervision of a group of Worthington operating divisions which were recently organized under the corporation's decentralization program. Mr. Tullo continues as general manager of Worthington's largest division at Harrison, N. J.

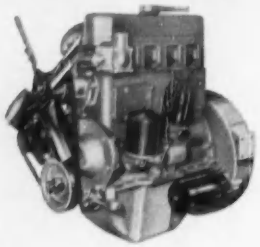
Robert Bosch Corp. President

Paul H. Kurz has passed away. His death was announced by W. Boedecker, sales manager.

HERCULES *announces*

new INTERCHANGEABLE models

G.O. SERIES **GASOLINE OVERHEAD VALVE**



G.O. 4 CYL.

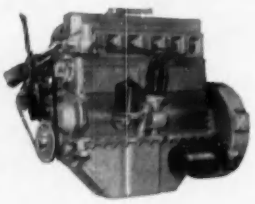
G.O. 4 CYL.

Model	Max. H.P.
G.O. 173	67 @ 3200 R.P.M.
G.O. 198	76 @ 3200 R.P.M.
G.O. 226	87 @ 3200 R.P.M.

G.O. 6 CYL.

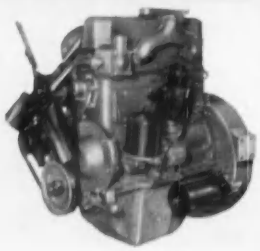
Model	Max. H.P.
G.O. 260	102 @ 3200 R.P.M.
G.O. 298	114 @ 3200 R.P.M.
G.O. 339	131 @ 3200 R.P.M.

Also available for L. P. G., Kerosene and Natural Gas



G.O. 6 CYL.

D.D. SERIES **DIRECT INJECTION DIESEL**



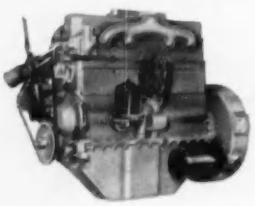
D.D. 4 CYL.

D.D. 4 CYL.

Model	Max. H.P.
D.D. 173	50 @ 2000 R.P.M.
D.D. 198	57 @ 2000 R.P.M.
D.D. 226	65 @ 2000 R.P.M.

D.D. 6 CYL.

Model	Max. H.P.
D.D. 260	75 @ 2000 R.P.M.
D.D. 298	85 @ 2000 R.P.M.
D.D. 339	99 @ 2000 R.P.M.



D.D. 6 CYL.

Additions – to the extensive line of **Hercules Engines**

With the addition of these four new series consisting of 12 models, the Hercules Motors Corporation has increased its line of engine sizes and types to better serve the varied needs of the many industries which require gasoline and diesel engines for their power requirements. This expansion of the Hercules line will enable manufacturers of end products to have a wider selection of engines and power units to meet individual requirements, all available from one dependable source.

Mounting dimensions of the new G.O. gasoline and D.D. diesel four cylinder engines are the same. The G.O. gasoline and D.D. diesel six cylinder engines are also interchangeable from the standpoint of mounting dimensions. Since this new series consists of parallel lines of gasoline and diesel engines, they can be used interchangeably, if desired, in any end product within the recommended engine speed ranges. Further, these engines can be built with manifolds and accessory equipment on either side, as the cylinder blocks are symmetrical and can be turned end for end.

Another important feature of these new models is the great number of parts which are interchangeable between the fours and sixes, and also, between the gasoline and diesel. This greatly simplifies the parts and service requirements. The only essential differences between these gasoline and diesel engines are cylinder heads, manifolds, pistons and fuel handling equipment.

Further information on the G.O. and D.D. series may be obtained by writing the factory.

HERCULES MOTORS CORPORATION

CANTON, OHIO

news of our industry

Highway Truck Automatic Transmission

The first automatic transmission to be designed specifically for highway trucks is now in production at the Allison Division of GM. According to E. B. Newill, General Manager of Allison and Vice President of GM, the new transmission CTP-4 Powermatic is a logical extension for highway use of the Allison Torqmatic Drive. This Torqmatic Drive is now widely used in heavy-duty, off-highway equipment.

The reason for entering the on-highway truck line is to provide the highway truck driver with the same ease of handling enjoyed by the off-highway operator.

Fully automatic, the CTP-4 is self contained in one package and features a torque converter-type full power shifting, heavy-duty transmission with six speeds forward and one reverse plus an integral hydraulic retarder for braking action.

Controlled entirely by oil, the retarder relieves the service brakes from long downhill duty and dynamically controls the descent of the truck so that it holds it on the hill. It is claimed that it will not wear out and long downgrades can be traveled faster and without danger of overheating the service brakes. The driver is actually provided with a braking force about six times that of engine braking.

The Powermatic is said to instantly and automatically balance engine power to the performance demand by selecting the most efficient gear ratios. In addition a unique gear system makes at least two gear ratios available in each of the three forward ranges. This is accomplished with no increase in size and weight above that of an ordinary transmission.

With elimination of the clutch pedal and conventional gearshift lever driver fatigue is reduced. This together with the new lock-up clutch which locks the engine in all six speeds makes for better and more

economical performance and safer operation.

The torque converter contains four elements and operates as a hydraulic torque multiplier and a fluid coupling. Its high torque ratio is said to allow starting loads without shocks or excess shifts at low speeds.

The heart of the Powermatic is the hydraulic control system. It synchronizes all the shift sequences to provide a smooth, positive flow of engine power from one gear to the next. The speed and torque to meet the changing road and load conditions are automatically varied.

Maintenance-wise the powermatic is said to require no adjustments for wear and service. The fluid drive eliminates shock load damage to drive line components and the steady flow of power permitted by the converter is claimed to prevent harmful engine lugging and stalling.

N. Y. Central Reorganizes

A plan decentralizing management of maintenance of equipment giving more authority to personnel at lower levels has been initiated by the New York Central System.

Keeping in step with advancement in train design and efficiency, a sweeping reorganization of company policy and personnel is now in effect. This plan not only applies to sales and service but to every department in the company.

British Railway Diesels

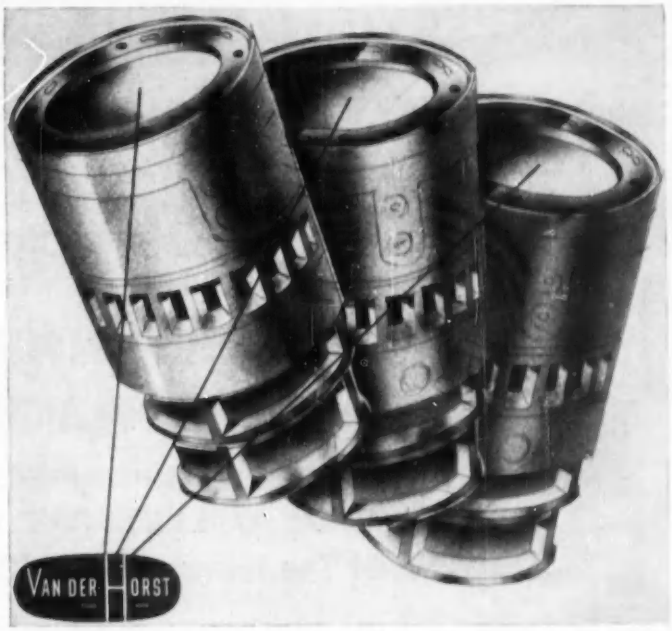
As part of a $3,230,000,000 modernization program, British Railways is starting on widespread dieselization of its properties.

Contracts have been awarded to British manufacturers for 28 million dollars worth of locomotives.

In addition the company will get 140 more main line locomotives and 30 diesel power units.

With the receipt of all this power, steam will almost disappear as motive power on British railroads.

5 *big advantages of*



PORUS - KROME

Good for the Life of your Engines

PORUS - KROME — INCREASES PISTON RING LIFE UP TO 50%.

PORUS - KROME — INCREASES CYLINDER LIFE 3 TO 5 TIMES.

PORUS - KROME — DEFINITELY CONTRIBUTES TO A REDUCTION IN LUBE OIL CONSUMPTION.

PORUS - KROME — DEFINITELY CONTRIBUTES TO REDUCED DOWNTIME FOR ENGINES.

PORUS - KROME — ELIMINATES STOCKING OF OVERSIZED PISTONS AND PISTON RINGS.

Write today for detailed information

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HILVERSUM, HOLLAND — LOS ANGELES, CALIFORNIA*

*SparTan Engineering

THERE'S A LUBER-FINER MODEL FOR EVERY TYPE OF ENGINE FOR EVERY TYPE OF OIL!

Model 750-C

Model 200-S

Model 135-S

Model 78

Model 500-C

Models F-155 F-120

Models 272-C 363-C

Models 750-2C 750-3C

ONLY A GENUINE Luber-finer PLUS A GENUINE LUBER-FINER PACK

CAN GIVE THE EXCLUSIVE PATENTED FILTERING PROCESS THAT HAS MADE LUBER-FINER THE Standard Of The Industry Since 1936

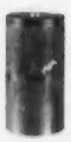
MODELS 78, 135-S, 200-S, featuring single-bolt lid, screw-in type pack, and overall compact design for use where space is limited. These Models provide the ultimate in filtration for passenger cars, small trucks and tractors, and other similar engines up to 5-quart, 6-quart, and 7-quart crankcase capacities.

MODELS 272-C and 363-C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, screw-in type pack, and rugged construction throughout. Designed for heavy-duty service on gas, gasoline or diesel engines up to 3-gallon and 4-gallon crankcase capacities.

MODELS 500-C and 750-C, featuring the Luber-finer single-bolt lid clamp O-Ring lid gasket, large-capacity packs, and extra rugged construction to withstand the most severe service. Designed for use on gas, gasoline or diesel engines up to 5-gallon and 8-gallon crankcase capacities. Also widely used on fuel lines, hydraulic oil systems, and many other industrial applications.

MODELS 750-2C & 750-3C, featuring the Luber-finer single-bolt lid clamp, O-Ring lid gasket, and multiple packs for extra large capacity. Available with either wall or floor mounts for industrial use on engines up to 35-gallon sump, fuel lines up to 15 GPM, hydraulic oil systems up to 450 gals. For larger capacities, two or more Units can be connected in parallel.

MODELS F-120 and F-155, for gasoline and diesel fuel lines on mobile, stationary, or marine applications. Extremely efficient in removing impurities and contaminants from fuel. Single Units will handle flow rates from 0.5 to 1.0 GPM on suction or gravity flow. For larger capacities, connect two or more Units in parallel, or install on pressure-side of fuel pump.



GENUINE LUBER-FINER PACKS available in two types...

DIESELPAK — Expressly designed and recommended for use with all detergent-type compounded oils. Has the ability to remove the most finely dispersed contaminants without removing or affecting the additives.

REFINING PACK — For use on straight mineral oil, synthetic oils, diesel fuel oil, hydraulic fluids, etc.

★ **THERE IS A GENUINE LUBER-FINER MODEL FOR PASSENGER CARS, TRUCKS, TRACTORS, STATIONARY AND MARINE ENGINES, HYDRAULIC OIL SYSTEMS AND MANY INDUSTRIAL APPLICATIONS.**

WRITE FOR COMPLETE INFORMATION TO DEPT. 73

LUBER-FINER, INC. 2514 S. Grand Ave., Los Angeles 7, Calif

news of our industry

Gear Manufacturing Equipment.

Installation of new equipment for the making of large hypoid zerol and spiral bevel gears has been announced by the Illinois Gear & Machine Co. This equipment will handle gears up to 6-ft in diameter, 10-in face, 0.75 diameter pitch (4.188-in C.P.) and 2⅞-in tooth depth.

Hypoid gear sets with 10-in off-set of the pinion can also be produced with this equipment. An important feature of this machine is the quick return drive of the cutting tool.

Heavy-duty gear drives for diesel driven oil field drilling units, giant ore crushers and pulverizers, steel mill equipment and machine tools are among the applications for gearing of this type.

Additional equipment for flame surface hardening, testing and lapping these gears has also been installed. The testing machine has a power traverse on both heads which can be operated to test the gears at loads and speeds similar to operating conditions. This machine will also test spur, helical, herringbone and angular gears up to 90-in diameter.

The flame surface hardening machine is electronically controlled to minimize distortion and produce uniform heat treatment. Gears up to 120-in diameter can be hardened in this manner.

Diesels Save Millions for Army

Powered by two GM Detroit Diesel model 6-71 engines driving LeTourneau-built generators, a self-propelled Army Transportation unit is capable of recovering stranded or capsized landing craft.

The machine, designed and built by R. G. LeTourneau, Inc., consists of an intricate arrangement of motor-powered hoists and wheels which can straddle a 67-ton vessel and literally lift it from the water. The machine can "right" a capsized or stranded vessel, transport it to deeper water or carry it out of the water onto the shore.

news of our industry

This landing craft retriever is electrically self-propelled and travels on four tubeless rubber tires 10 ft. high and 4 ft. wide. Each of these wheels has a separate electric motor and gear reduction built into it.

Because these are contained within the centers of the wheels themselves and frequently must operate under water, each is totally waterproofed and furnished with air under pressure for cooling.

A system of simple electric switches makes it possible for only one man to operate all functions of this 101-ton unit which is 75-ft long, 38-ft wide and 22-ft high. However a crew is needed for attaching hoist cables to the grounded or capsized craft.

The unit is capable of recovering craft in water up to 8-ft in depth and even fully loaded it can climb a 20% grade.

Army studies show that only 10% of landing craft put out of action during World War II was due to direct enemy activity. Most of them were put out of action by rough seas and high winds which caused them to be sunk or grounded. It is estimated that millions of dollars will be saved by the mechanized recovery of vessels sunk under similar conditions in the future.

Bureau of Standards Changes Saybolt Determination.

SUS and SUF viscosities are now obtained more accurately by converting from kinematic viscosities than by use of Saybolt viscometers.

Since ASTM has made available the conversion tables and factors, the National Bureau of Standards has decided to abandon the master Saybolt viscometers as standards. Apparently, Saybolt viscosities are still to be used but the Bureau depends upon conversions for determining Saybolt viscosities. In other words, it is the method of Saybolt viscosity determination that will change, not the Saybolt system.

What Do You Know!

(*Answers to Questions on Page 39*)

1. Correct answer is "b". Both tests and actual dual-fuel engine operation have shown that advancing the injection timing of the pilot oil results in lower fuel consumption and fuel costs. See Page 62.

2. Correct answer is "b". Although the displacer piston does compensate for fuel pump leakage its main purpose is to allow a longer plunger stroke. The displacer piston makes only a portion of this long stroke effective and in this way eliminates the porting problems inherent when the plunger has short effective strokes. See Page 62.

3. Correct answer is "b". Since the purpose of pilot fuel oil is to ignite the gas at the right time and help it to burn smoothly only a small quantity is necessary. This amounts to about one third that needed even for idling of diesel engines of similar output. See article on Page 62.

4. Correct answer is "a". The use of larger-bore sleeves by engine manufacturers to increase the power output of their new engines has been extended by many parts manufacturers to the older model engines in the field. Most of these engines can take the greater stresses resulting from increased output because they were originally built with a higher safety factor than was needed. See article on Page 55.

5. Correct answers are "b & c". By increasing the engine output so that it will not operate under constant overload conditions, engine life will be lengthened and maintenance costs and downtime reduced. See article on Page 55.

6. Correct answer is "a". Clouding up of sight feed glasses results in frequent disassembly and servicing. New vacuum-type lubricators eliminate this problem. See article on Page 43.

NOW!

a *Faster* way to clean Heat Exchangers

No need for resorting to laborious disassembling and hand-cleaning when your heat-exchangers become clogged. Now, you can clean them *in place* the modern Oakite way by merely circulating a solution of specialized Oakite detergent through the tubes and shell! The soil is *chemically* removed—faster and more economically than any old-fashioned hand method. Check these other advantages:

- ★ Thorough soil removal
- ★ Cleaning action reaches all areas
- ★ Less wear and tear on units
- ★ Reduces unit down-time
- ★ Makes man-hours more productive
- ★ Reduces consumption of fuel and cooling water

Your local Oakite Technical Service Representative will be glad to give you more details. Call him today—or send for your FREE copy of illustrated pamphlet F9442. There's no obligation. Write Oakite Products, Inc., 22C Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

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MATERIALS · METHODS · SERVICE

Technical Service Representatives in Principal Cities of U.S. and Canada

news of our industry

Crane Conversion to Diesel

Lower operating costs, less maintenance and easier operation have resulted from the steam to diesel conversion on a 20-ton railroad crane. Its owners, the Broderick Wood Products Co., use the crane to load telephone poles on railroad cars, stock yard material and do some maintenance work around the company yard.

The biggest problem with the steam crane came in the winter time when the steam lines would freeze up over night and steam condensation would freeze and jam hoist drums and other working parts.

Other problems which the steam unit presented were, high fuel consumption of 150 gallons a day, 1½ hr preparation to get pressure up, constant maintenance of the boiler, soft plugs burned out regularly, rolling tubes being loosened frequently and a constant demand for water.

Since the crane is and must remain in constant use it was decided the best remedy was a diesel torque converter unit. A Caterpillar D315 diesel engine and Twin Disc torque converter were chosen and replaced the steam unit.

The results of the conversion were a 95% cut in fuel consumption, quicker starting in all kinds of weather, less maintenance on the power unit, better appearance, and more constant power at all times.

Only 7-gal of No. 2 diesel fuel is now used per day. And the crane is being used even more than before the conversion. A 24-v starting system makes the engine start in all kinds of weather.

With the 77-hp Cat diesel engine a new drive arrangement was installed. A main drive shaft with double sprockets on each end was installed below the travel drum shaft. This new shaft is driven from the torque converter shaft through a triple width chain. The main drive shaft in turn drives the travel drum shaft through a chain belt on each of the four end sprockets. The rest of the drive and lifting mechanism was left intact.

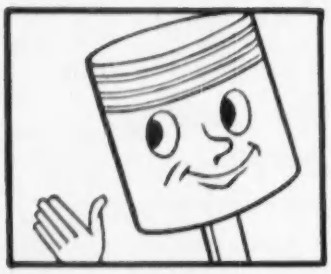
The whole conversion took a little over two weeks at a cost of less than one eighth the cost of a new crane of similar size.

Recreation Project Relys on Diesels

A multi-million dollar recreation project on Presque Isle Penninsula off Erie, Pa. is depending on diesel powered equipment.

A GM Detroit Diesel powered Bucyrus Erie with clam bucket is seen helping to clear a large lowland area from which sand will be taken to cover beaches, etc.

TRIPLE PLAY AT FLOOD TIME

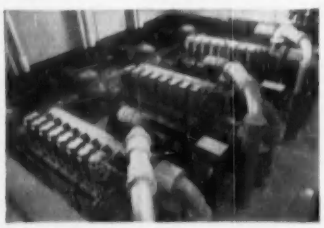


by Cecil Diesel

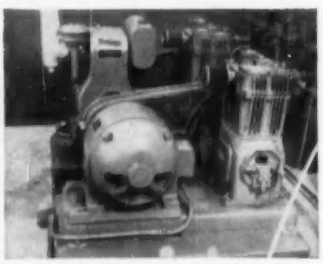
ROVING REPORTER

As one Oakland city official puts it, "We're so sure those Quincys will always start, we don't even have an attendant here." Even if all electric power would fail, gasoline-powered Quincys start the diesels anyway . . . and supply air for controls.

OAKLAND, CALIF. — The place: a storm water pumping station. It's been raining for hours. Will streets flood and cause costly water damage? Listen for the triple play.



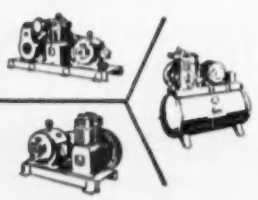
Diesels start purring . . . pumps start pumping . . . and Quincy Model D340 Compressors start humming. Here's what's happening. Flood water level rouses four pump-driving Enterprise DSG-318 Diesels to action. Then as tank air pressure drops below 220 pounds, Quincy Compressors automatically start . . . build pressure back up.



And there's a Quincy Compressor for every diesel starting job. Let Quincy help you select the right model from a range of mountings and sizes — from 1 to 90 CFM. Write them for a catalog.

Quincy COMPRESSORS

QUINCY COMPRESSOR CO.
DEPT. J-47, QUINCY, ILLINOIS



World's finest air compressors

B & W Making 339 Turbocharged Diesels

Burmeister & Wain, one of the pioneers in turbocharging 2-cycle single acting diesel engines reports they have 339 turbocharged marine engines on order.

This is over 62.5% of all the turbocharged engines for motor ships on order throughout the world.

New Gas Engine Ignition Unit

A new ignition system for heavy-duty high compression gas engines used in the petroleum, aluminum production and power plant field has been brought out by the Scintilla Division of Bendix Aviation Corp.

This system combines a new type Bendix LC magneto with the company's Hi-V transformer coil. It was engineered to meet the exacting requirements of 6 to 16 cyl stationary industrial engines ranging from 1,000 to over 4,000 hp.

It is said that this new system is precisely balanced and delivers more than ample voltage with minimum spark plug erosion. In addition the LC magneto has a high output at normal cranking speeds and does not require an impulse coupling for starting.

Bendix officials claim that its features include: magneto shaft mounted on sealed ball bearings; cam, and cam follower matched for minimum wear; all components designed to withstand severe shocks; dustproof ventilation; windows in distributor housing cover and gear box for easy accessibility for servicing; long service life; reduced maintenance costs and flame proof design. They point out that adjustment of the master breaker of the LC magneto is normally required only once a year during major engine overhaul periods.

The unit breaker assembly is easily adjusted and operates with minimum wear due to low current at the breaker points. Advancing or retarding the spark is accomplished by rotating the entire magneto section either manually or through a mechanical linkage. This makes the voltage remain constant.

For use on odd-firing engines and with dual ignition systems having staggered timing, Bendix has developed the DLC model magneto.

COMPACT DETROIT CONTROL PROTECTS YOUR DIESEL

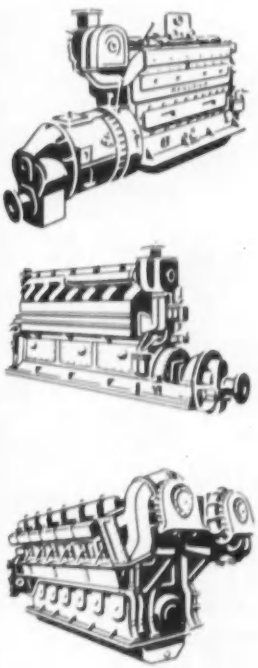
223 Control, cover removed

Detroit 223 Control has wide application in lube oil pressure and temperature alarm systems. It is also used as an automatic engine control switch for emergency shutdown and in other critical functions. This rugged control is only 4 15/16" x 4 5/8" x 2 3/4" and weighs 2½ pounds. The 223 Control is water tight and not affected by conditions of high temperature and high humidity.

This automatic switch is actuated by either pressure or temperature. It can control several circuits, it can actuate a program of safety circuits or it can govern one circuit alone.

Marine, locomotive and stationary diesel engines, pumps, oil drilling engines, mobile compressors and dynamos are only a few applications where Detroit 223 Control safeguards valuable engines and machinery.

Bulletin 257 will be forwarded at your request.



Detroit Controls supplies a wide variety of dependable automatic controls for industry.

DETROIT CONTROLS CORPORATION

5900 TRUMBULL AVE. • DETROIT 8, MICHIGAN

Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

AUTOMATIC CONTROLS for INDUSTRIAL USES

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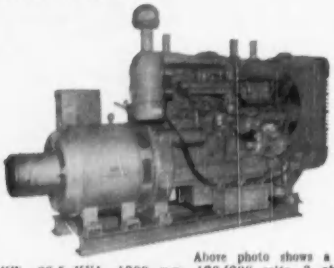
KATO

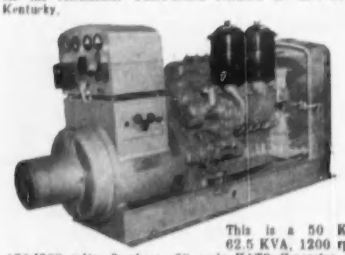
Continuous A.C. Standby Power

GENERATORS

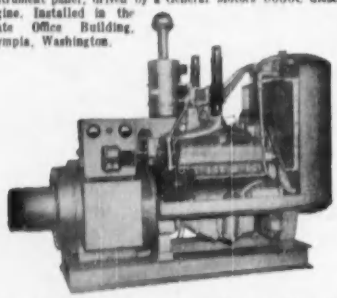
. . . a size and type to meet your needs to 400 kw



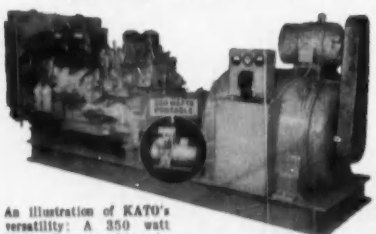
Above photo shows a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generators and instrument panel, driven by an International Model UD-18A diesel engine. Installed for the Mechanical Construction Division in Salt Lick, Kentucky.



This is a 50 KW, 62.5 KVA, 1200 rpm, 120/208 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by a General Motors 6030C diesel engine. Installed in the State Office Building, Olympia, Washington.



This pictures a 75 KW, 93.5 KVA, 1800 rpm, 240 volts, 3 phase, 60 cycle KATO Generator and instrument panel, driven by an H-540 LeRoi engine utilizing natural gas for fuel. Installed for Republic Steel Corporation of Gary, Ind.



An illustration of KATO's versatility: A 350 watt KATO Generator driven by a Lauson LMH engine and a 150 KW, 187.5 KVA, 750 rpm, 120/208 volts, 3 phase, 25 cycle KATO Generator and instrument panel—driven by a General Motors twin 6-71 diesel engine. For Duluth, Mesabi & Iron Range Railway.

Your Inquiries Invited.

Builders of fine Electrical Machinery Since 1928

KATO *Engineering Company*

1498 First Avenue, Mankato, Minnesota

new products

Tachometer with Speed Controls

A tachometer which not only indicates speed but also actuates self-contained power relays that signal overspeed and underspeeds can now be obtained from the Metron Instrument Co.

Besides sounding alarms or turning on light signals they can also be used to start and stop engines open or close valves, control speeds and other similar applications.

These tachometers are available with any one of 48 scales marked in any rate such as rpm, fpm, etc.

The high and low limit pointers of the tachometer which are independently adjustable act as a single-pole double throw switch while the regular speed pointer acts as the switch center arm. A manual reset push button is used to reset the tachometer after the relays have signalled a high or low speed.

Direct Fired Oil-Gas Space Heater

Many features are claimed and guaranteed by the Airtherm Mfg. Co. for their new direct fired oil-gas space heater. It is equipped with a single switch changeover from oil to gas.

Made in eight sizes ranging from 400,000 to 2,000,000 btu per hr it has an automatic electronic combustion control system. Each of its functions is controlled by a separate motor.

Lubricating Sticks

Primarily developed for reducing wear on flanged wheels of switch locomotives, Transall Inc. claims that their Lubricating Stick is also applicable for overhead cranes or any rolling stock equipment having excessive flange wear.

Composed of several greaseless nonfriction ingredients, this stick is not affected by water or extreme climatic temperatures and does not creep across the face of the wheel.

Quality Precision Crankshafts For Diesels — Since 1910 . . .

Consult ELLWOOD on all Your Forging Requirements

ELLWOOD CITY FORGE COMPANY

CRANKSHAFTS - CONNECTING RODS
MACHINE FORGINGS

ELLWOOD CITY, PENNA.

new products

Disposable Industrial Paper Wipers

Designed for use in wiping anything from heavy machinery to precision work, paper wipers made by the Scott Paper Co. are now available in two sizes 9⅝ x 13⅝-in and 9⅝ x 10¼-in.

Advantages claimed for these wipers are savings in cost over other wiping methods, better health protection less employee accidents and less chance of scarring delicate surfaces.

Industrial Plant Trucks

Equipped with a revolving head to permit automatic dumping, an industrial truck made by The Elwell Parker Electric Co. is already in use.

By rotating its forks, the truck discharges its load easily.

Miniature Relay

A 20-amp mercury plunger-type relay introduced by the Ebert Electronics Corp., is claimed to be the smallest on the market. Measuring only 3½-in high, 1¾-in wide and 1½-in deep it is said to have a load capacity twice that of ordinary armature-type mechanical relays of equal size.

The relay has only one moving part and its contacts are enclosed in hermetically sealed heavy industrial glass for safe and silent operation.

Gas Pressure Regulator

Designed to meet demand for accurate, dependable pressure control over a wide range of temperatures and pressures, Reaction Motors, Inc., Rockaway, N. J., has developed a new type of gas pressure regulator. A single-stage unit, it maintains regulated pressure over inlet pressure, it is claimed, comparable to multi-stage units. This is achieved by pneumatic balancing. Elimination of external bleed gives greater safety in handling hazardous gases.

Cutoff Problems Eliminated

According to the Victor Engineering Corp. the Valor Saw gives such smooth easy cutting of metals that hardly any burr remains to be machined. It also permits cutting up to 45 deg with material remaining in the same position as for a straight cut.

Having a large bed and 16-in blade, the saw is standardly equipped for wet cutting but can be used dry when necessary.

Template Kit for Piping Layouts

A new matched set of five reversible templates for drawing general layouts or details of railroad, marine and power plant piping and valving systems has been introduced by A. Lawrence Karp.

Having all American Standard symbols and provisions for new or special symbols, its use is claimed to cut to a fraction the ordinary time required to make these layouts.

Frame Hoist and Hand Truck

Ninety-degree turns can be made easily with the flick of a wheel shift on the new Directo Truck Co. heavy-duty hand truck. Additional features of this hand truck are that it has snap-action directional wheels which can be locked in forward and sideward positions.

A hoist frame capable of lifting weights up to 300 lb has been designed for use in conjunction with the hand truck.

WRITE FOR REPORT ***that shows how to minimize injector tip erosion . . . remove 99.95% water and 99.0% abrasive from Diesel fuel oil***

Height, 25⅞"
Diameter, 11¼"

BRIGGS FILTER/ SEPARATOR

THE COAST GUARD DID IT ON THEIR NEW BRIGGS EQUIPPED 95' DIESEL PATROL BOATS

Water, water-oil emulsions and abrasives are a definite . . . and preventable problem. This amazing report shows how to whip this condition by the use of a small all aluminum, high efficiency filter/separator with a single two-stage element. The report is full of answers you want.

WATER AND ABRASIVES REMOVAL FROM FUEL OIL OF SEA GOING VESSELS

Briggs

OIL FILTERS

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WASHINGTON 16, D. C.
DEPT. 91

YES! Send me your report

Name .....

Company .....

Address .....

How much of your engine maintenance bill is due to repair of breakdowns that could have been avoided—*if you'd had advance warning?*

At a fraction of that cost, Alnor Exhaust Pyrometers offer you a constant check of engine performance—advance warning of

Cylinder Overload **Preignition**
Scaled Jackets **Clogged Ports**
Detonation **Faulty Injection**

Get the best from your diesel—minimum fuel consumption per horsepower and long service uninterrupted by foreseeable breakdowns. Get constant protection of your engine, cylinder by cylinder, with an Alnor engineered Exhaust Pyrometer System.

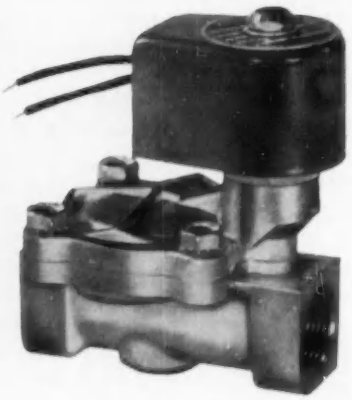
Get Full Information—*Quickly!* Your nearby Alnor Diesel specialist is conveniently listed in the classified directory. Ask him to help you select the Pyrometer and thermocouple assembly designed for your engine. Or send for Bulletin 4361 with complete details of the full Alnor line of Pyrometers.

ILLINOIS TESTING LABORATORIES, INC.
Room 507, 420 N. La Salle St.,
Chicago 10, Illinois

new products

New Shut-Off Solenoid Valve

A new general purpose 2-way solenoid valve with a full area port has been introduced by the Automatic Switch Co. Using only three operating parts it has no stuffing boxes or sliding glands, but can handle oil, water, gas, etc., up to 125 psi.



Rechargeable Flashlight Battery

Gould-National Batteries Inc., has placed on the market a rechargeable, hermetically sealed nickel-cadmium battery cell in which the electrolyte is potassium hydroxide.

The first consumer package consists of a 2-cell flashlight and charging unit. These "Multi-Lite" cells, as they are called, can be recharged over 200 times and don't deteriorate even if overcharged or undercharged.

Power Supply Leads Reduced

Now new polarized connectors give you completely cabled power supplies with only two screw-type connections. One is for high voltages and one for low voltages. This eliminates the need for bringing a lead to each of a number of single bushing terminals.

This input plug which cuts down the number of leads to power supplies was introduced by the Condenser Products Co.

NEW PRESSURE SWITCH HAS MANY USES—

★ As Low Oil Pressure Signal
★ To Energize Electrical Circuits
★ As Low Air Pressure Signal

This new Rochester Pressure Switch is designed for heavy duty and close calibration. Will stand heavy pulsating pressure and other rugged conditions. Both single and double terminal models. Close "on" and "off" differentials. Maintains consistent cut-in, cut-out settings. Built-in overload protection. 1¾" diameter case. ⅛" or ¼" pipe thread fitting.

- HEAVY STAMPED STEEL CASE
- HERMETICALLY SEALED
- SPRING LOADED DIAPHRAGM
- EXCLUSIVE RMC DIAPHRAGM SEAT DESIGNED FOR EXTRA STRENGTH

Write for literature and/or sample.

ROCHESTER MANUFACTURING CO.
9 ROCKWOOD PLACE • ROCHESTER 10, N. Y.

organizational news

Named General Manager
of the Manufacturing Dept. and chairman of the Manufacturing Committee of Socony Mobil Oil Co., Inc. R. Rea Jackson's appointment becomes effective February 1. He succeeds G. E. Dunham, Socony Mobil director and executive in charge of manufacturing.

Perfect Circle Corp. Appointments
include Maurice H. McKinnon as manager of the Hagerstown plant and Blair T. "Budd" Martin as ass't. sales manager.

Staff Engineer
is the new title for Rober J. Wright of American Air Filter Co. He was formerly resident engineer for the W. W. Sly Mfg. Co.

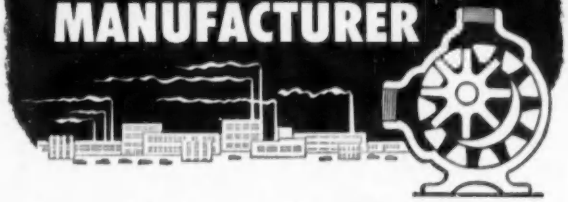
F. E. Harrell

A. G. Massey

General Managers
are the new titles for both Mr. F. E. Harrell and Mr. A. G. Massey. Mr. Harrell has been named new general manager of the Marquette Metal Products Division of Curtiss-Wright Corporation. Mr. Massey is going to be general manager of the Massey Machine Co., a subsidiary of the Marquette Metal Prod. Div. of Curtiss-Wright Corp.

Morse Chain Company's
new southeastern district manager is Raymond H. Whitney. This announcement also stated that he will headquarter in Charlotte, N. C.

Why Viking Pump is the
MANUFACTURERS' MANUFACTURER



Many original equipment manufacturers include Viking Pumps as components of their products. Vikings make possible custom-engineered pumps that serve their needs better, and at mass production prices. They benefit from more than forty-four years' experience, engineering skill and research on Viking Pumps. In many ways, Viking facilities serve to better advantage than a branch factory or special pump department.

If you have a product with a pumping problem, call on Viking engineers. With more than 750 cataloged models and thousands of specially applied pumps, Vikings may solve your problem at a big saving. For information, write for Bulletin Series 555d.

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THE ORIGINAL "GEAR-WITHIN-A-GEAR" ROTARY PUMP

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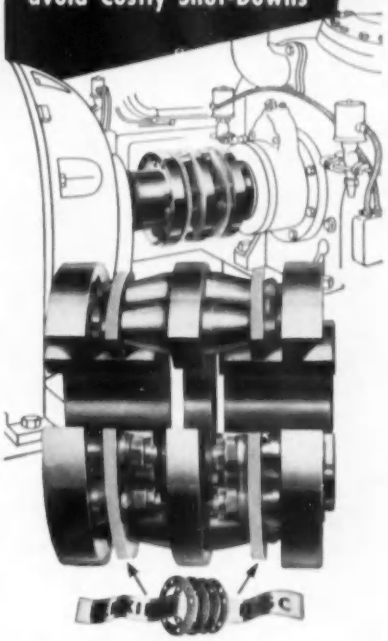
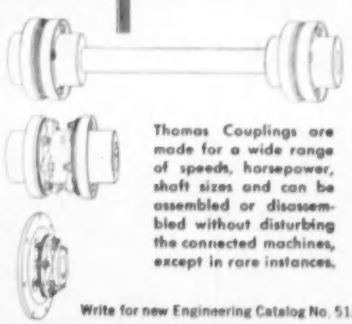


Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

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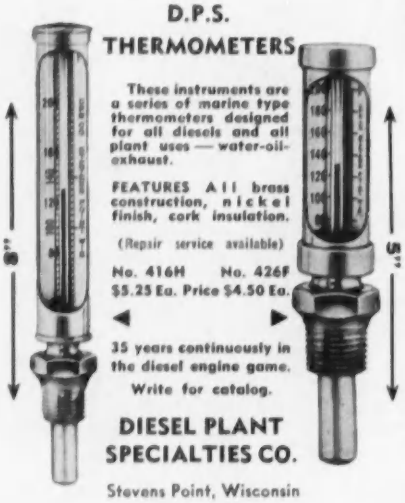

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new products

G. E. Motor-Generator Sets

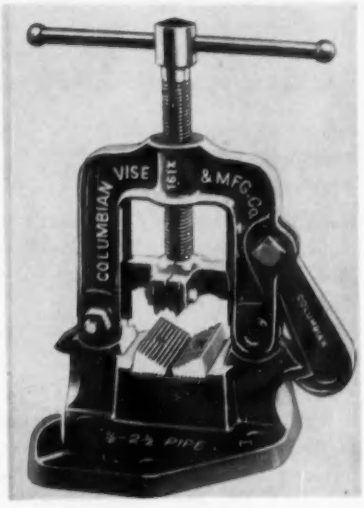
Fractional horsepower motor-generators in frame sizes 44, 66, and 74 are now available from General Electric Co.'s specialty component motor department.

They are said to be inexpensive and reliable means of getting direct current from an alternating current power source. They are used as a power supply for variable speed motors and as self-contained exciters of larger units, also for magnetic chucks.

Alternators for Vehicular Service

Leece-Neville Co. claims that sufficient current at all speeds can be obtained for vehicles driven regularly at slow speeds with frequent stopping and starting. They have designed two new heavy-duty alternators to replace standard DC generators on passenger cars, trucks, buses and for police cars, etc., which use 2-way radios or telephones.

In addition to giving ample current these alternators are expected to have longer life with less down-time than DC generators. Another feature is that a transformer can be attached to it to give up to 800 watts of 110-volt portable power.



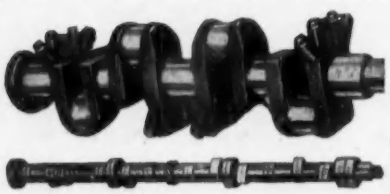
Pipe Vise Has Reversable Jaws

Increased life and greater holding power are the main features claimed for a "Long Jaw" hinged pipe vise announced by The Columbian Vise & Mfg. Co. Its lower jaws are reversable being milled on both sides to provide double life.

Having a pipe capacity range from ⅛-2 in to ⅛-4½ in, it also is equipped with a handy bender for small pipe.

Pneumatic and Hydraulic Valves

Four- and six-way solenoid operated pneumatic and hydraulic valves have been added to the Mar Vista Engineering Company's stock of shut-off and three-way versions.



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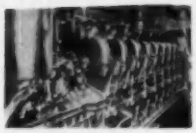

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Safety Brakes for Trucks and Cars

By sealing off the damaged section of a hydraulic braking system and leaving the other section in perfect working order, the Safety Brake Corp. claims that their device assures braking for front or rear wheels.

It is said that installation can be made easily without use of special tools. The device is held on the firewall by a bracket and weighs less than 2½ lb.

Fluidized-Coating Process

A new fluidized process of protective coating with plastic now permits spraying of parts which can't be accommodated by dipping. Corrosion resistant coatings of nylon and other plastics by this process are made possible by a dual-purpose Powder Fluidizer.

This compact unit consists of a specially designed compressed air system which keeps the plastic powder in a dense dry turbulent state. It is made by the American Agile Corp.

Muffler Paint Resists Burning

Alumicone and aluminum-silicone paint is said to withstand temperatures of over 1500°F. Based on silicone-alkyd resin and containing aluminum pigments supplied by Aluminum Co. of America, it is said to increase life of exhaust systems. According to its producers, Atech, Inc., Alumicone does not burn off and assures safer and longer performance life.

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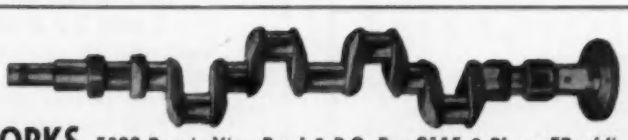

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A wrap-around mat using light wooden cleats and veneer slats bound by steel wire cut crating weight and costs by two thirds according to The American Box Co. It is also claimed to reduce the packing and unpacking operations to about one-tenth of the time formerly needed.

This no doubt is extremely desirable when many engines or engine parts have to be shipped or stored.

Indicator for Grinder Swivel Table

To provide accurate control for grinding close tolerance tapers, Norton Co. has developed a "Swivalign" dual electric indicator for measuring swivel table adjustment.

This device simplifies the adjustment of swivel tables on grinding machines to correct errors in grinding exact tapers or to eliminate taper in straight work.

Tube Expander for Heat Exchanger

The Torq-Air-Matic made by Thomas C. Wilson, Inc., is a tube expander with an all-air rotating type control. It is self-sustained, eliminating separate control cabinets, cables and other connections except the air hose.

It accurately controls tube expansion by directly measuring torque output at the output spindle right at the mandrel. This eliminates measuring errors caused by operating variables which effect conventional control types. Motor wear, quantity and viscosity of lubricants and voltage fluctuations don't affect it.

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These units contain snap action switches rated at 10 Amps.-110 Volts A.C. and can be used for either opening or closing a circuit at any RPM over 500. Adjustable while the engine is running for a plus or minus 20% of set speed.

The model shown here was designed for overspeed shutdown and is made for either automatic or manual re-set. Dust caps can be furnished with a variety of standard or special connector fittings.

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Automatic Engine Control Equipment
8151 NORTH RIDGEWAY AVENUE, SKOKIE, ILLINOIS

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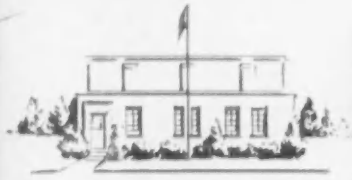
Melvin Nissen (left) plant superintendent Graettinger, Iowa, and Standard Oil lubrication specialist R. R. Spargo inspect maintenance records. Assisting customers with lubrication problems is something for which Bob Spargo is well qualified. He is a mechanical engineer with a degree from Iowa State College and a graduate of the Standard Oil Sales Engineering School. Bob has been providing lubrication technical assistance to Standard customers for nearly nine years. Customers find his experience and training pay off for them.



How STANDARD D&G Oil helped lick five problems in one plant

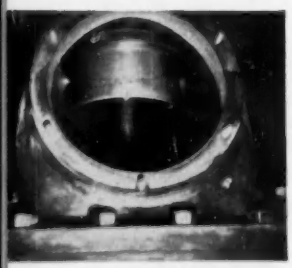
Excessive deposits, excessive maintenance, high oil consumption, were among problems solved by change-over to STANDARD D&G Oil at Graettinger, Iowa, Municipal Light Plant

Three years ago the Graettinger Municipal Light Plant began using STANDARD D&G Oil. Prior to this change-over, good engine performance was hampered by:

1. Excessive carbon deposits
2. Excessive port carbon
3. Stack fires
4. Ring sticking
5. High oil consumption

The plant averages 4.3 million HP hours of operation annually. Before changing to STANDARD D&G Oil, ports had to be cleaned several times a year. Now, with STANDARD D&G Oil in the engines, ports aren't touched between annual overhauls. Ring sticking and piston and cylinder deposits are virtually eliminated. All of this has been accomplished while continuing the use of low cetane, low gravity fuel.

Good management, careful maintenance and STANDARD D&G Oil have teamed to deliver this performance at Graettinger. Maybe you would like to use STANDARD D&G Oil to obtain similar performance from your engines. A Standard Oil lubrication specialist is nearby in any of the 15 Midwest and Rocky Mountain states ready to show you. Call him. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



Piston of one of F-M engines at Graettinger Light Plant. STANDARD D&G Oil has kept maintenance down, cut piston and liner wear.

Standard man Bob Spargo (left) and plant superintendent Melvin Nissen inspect piston through crankcase inspection plate hole. With STANDARD D&G Oil, light plant has cut oil consumption in half.

***Quick facts about* STANDARD D&G OIL**

1	Made from highest-quality solvent-refined stock.
2	Contains additives which impart superior detergent-dispersant and anti-corrosion properties.
3	Anti-foaming.
4	Oxidation resistant.
5	Recommended for use (1) with economy fuels, (2) in extreme-load and/or low temperature service.

STANDARD

STANDARD OIL COMPANY
(Indiana)